A Systems Approach to Retrospective Regulatory Review: A Case Study of Agricultural Regulation in Washington

Linda Abbott and James Schaub
USDA Office of Risk Assessment and Cost-Benefit Analysis

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History of Retrospective Regulatory Analysis

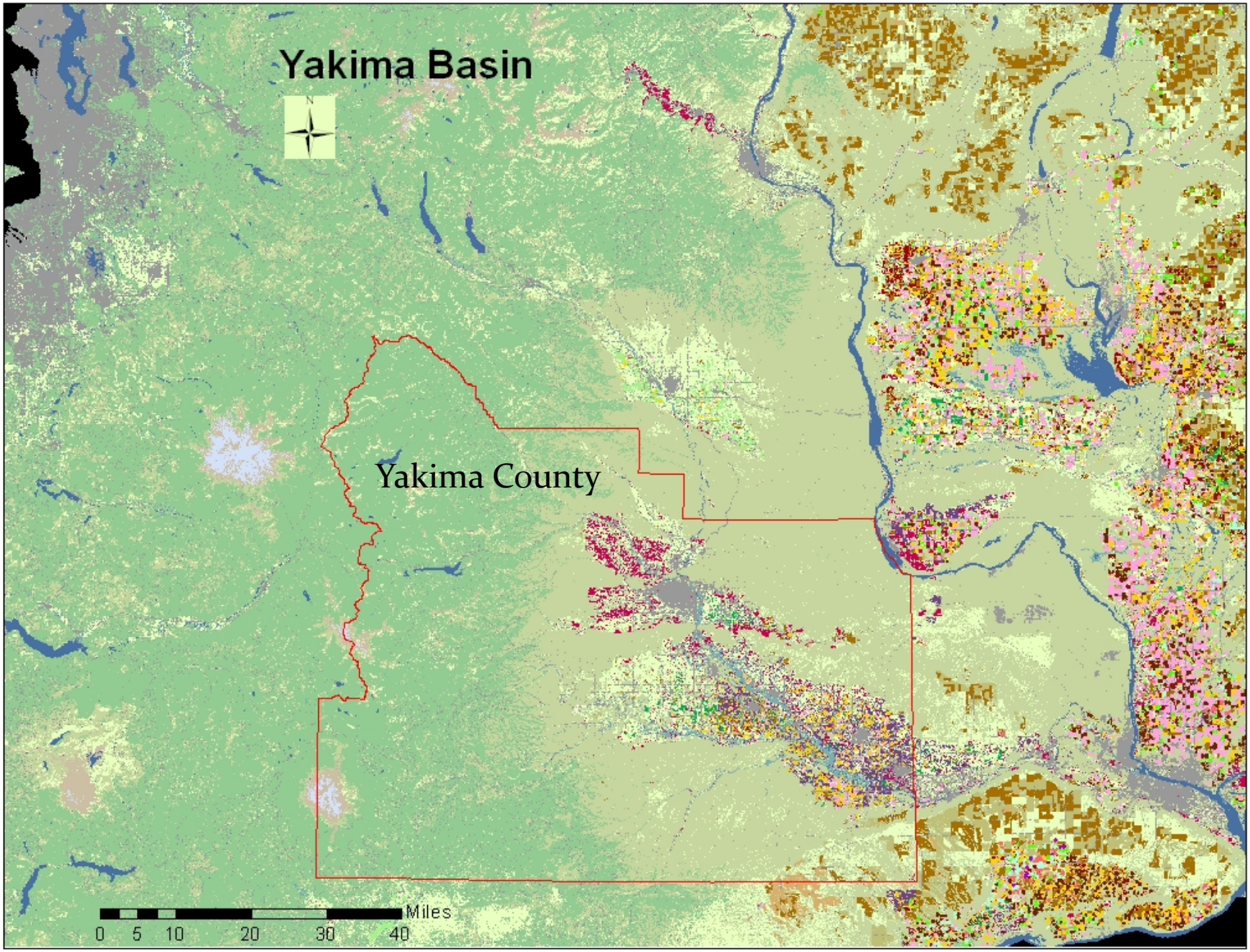
- Desire to conduct retrospective regulatory analysis is not new:
- E.O. 12044 (Carter) required periodic review of rules issued by federal agencies
- President Reagan's task force on regulatory relief was to recommend changes to existing regulations
- President H.W. Bush required agencies to remove unnecessary regulatory burdens
- E.O. 12866 (Clinton) required agencies to develop a program to periodically review existing regulations
- President G.W. Bush asked the public to suggest reforms to regulations

Goals of Retrospective Regulatory Analysis

- **Evaluate the effectiveness of a current regulation; was the regulatory goal achieved?**
- **Were the predictions of the economic analysis realistic with respect to benefits and costs?**
- **Did implementation of the regulation result in unanticipated benefits or costs?**
- **Can the previous economic analysis be replicated?**

Systems Approach to Regulatory Development

- **Agencies rarely have jurisdiction over all critical components in the systems relevant to their regulatory action**
- **Often regulatory actions appear to ignore the biological or economic system which they seek to regulate**


Yakima Basin
N
Yakima County
Miles
0 5 10 20 30 40

Washington Toxics and Critical Habitat Designation

- **Washington Toxics case 2002**
- **EPA sued for failure to consult with the National Marine Fisheries Service (NMFS) when EPA registered pesticides for national use**
- **Court ordered injunctive relief in the form of no-spray buffers for 54 pesticides**

- **2005 NMFS issued critical habitat designation for salmonids**
- **Required to conduct economic analysis on costs associated with consultation in critical habitats**

Pacific Northwest Salmon Critical Habitat Economic Analysis

Economic Analysis required for the establishment of critical habitat

Economic impact due to Section 7 consultation by federal agencies

Federal agencies must consult with the National Marine Fisheries Service to insure the agency's actions do not jeopardize endangered or threatened species or adversely affect critical habitat

Types of actions considered arise from costs due to consultations

Pacific Northwest Salmon

Salmon return to streams and rivers in the Pacific Northwest to spawn

Salmon are commercially harvested in the ocean and in certain locations in the Columbia River

Commercial fishery, recreational fishermen and Native Americans use the fish

Predators remove returning adults

Dams require returning adults to traverse fish ladders to return to spawning waters

Middle Columbia Steelhead Life History

Anadromous Form of Species

Steelhead

Egg

Fry

Fingerling Juvenile

Smolt

Oceanic Adult

Resident Form of Species

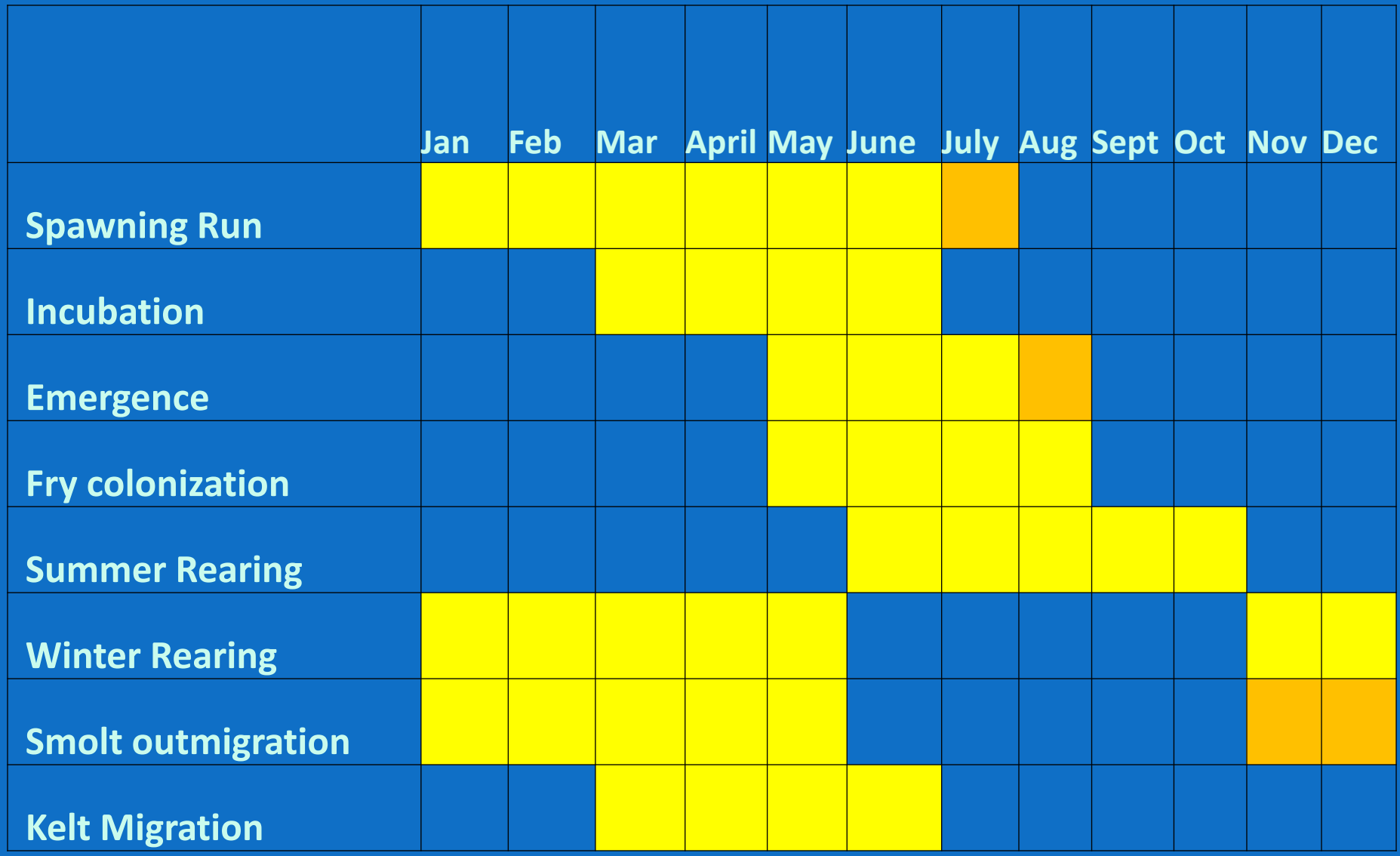
Rainbow Trout

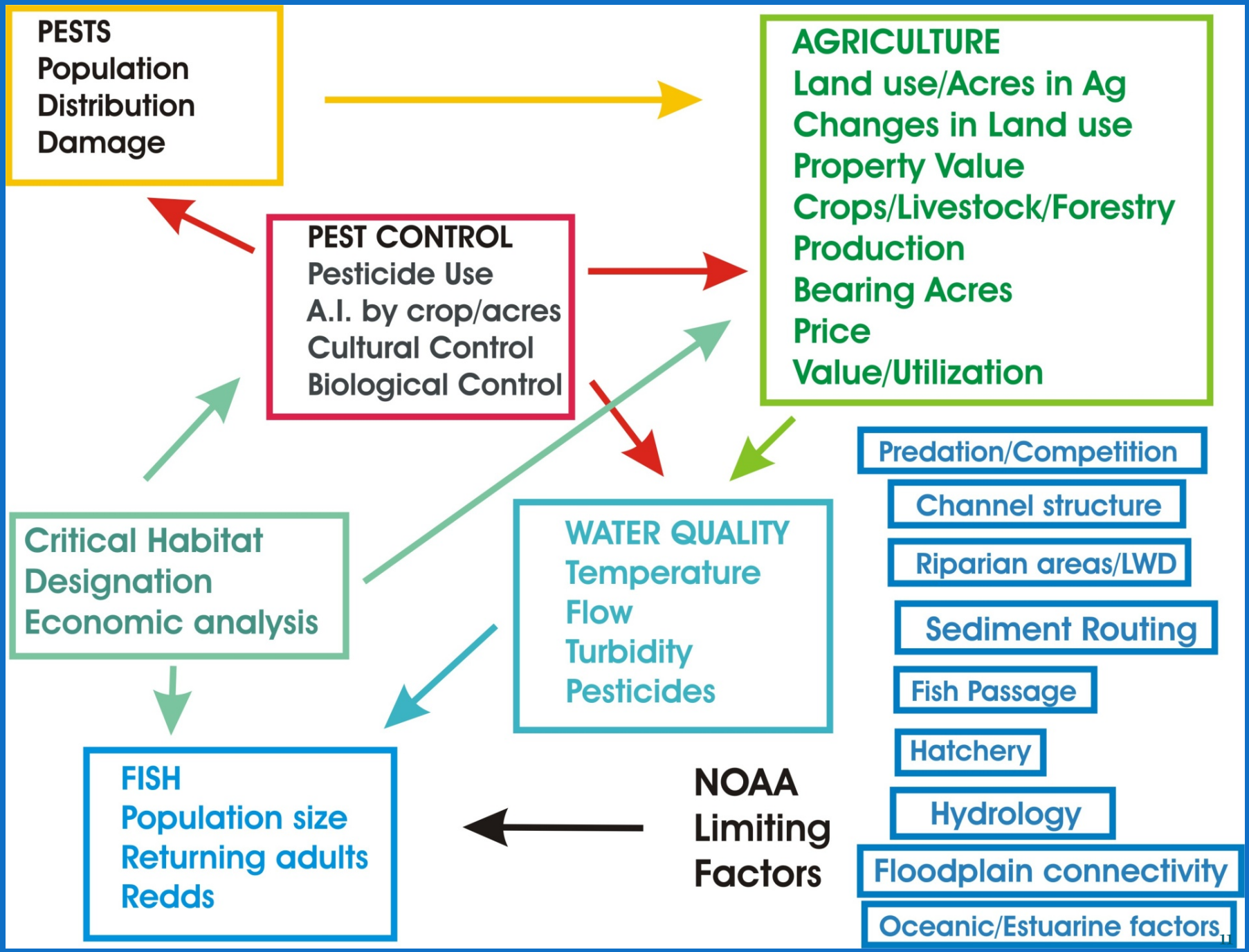
Kelt - Reconditioned

Spawning Adult

Jacks – Adults returning to Freshwater for maturation

Yakima Basin Salmon Presence




PESTS
Population
Distribution
Damage
AGRICULTURE
Land use/Acres in Ag
Changes in Land use
Property Value
Crops/Livestock/Forestry
Production
Bearing Acres
Price
Value/Utilization
PEST CONTROL
Pesticide Use
A.I. by crop/acres
Cultural Control
Biological Control
Predation/Competition
Channel structure
Riparian areas/LWD
Sediment Routing
Fish Passage
Hatchery
Hydrology
Floodplain connectivity
Oceanic/Estuarine factors
Critical Habitat
Designation
Economic analysis
WATER QUALITY
Temperature
Flow
Turbidity
Pesticides
FISH
Population size
Returning adults
Redds
NOAA
Limiting
Factors

Pesticide Registration

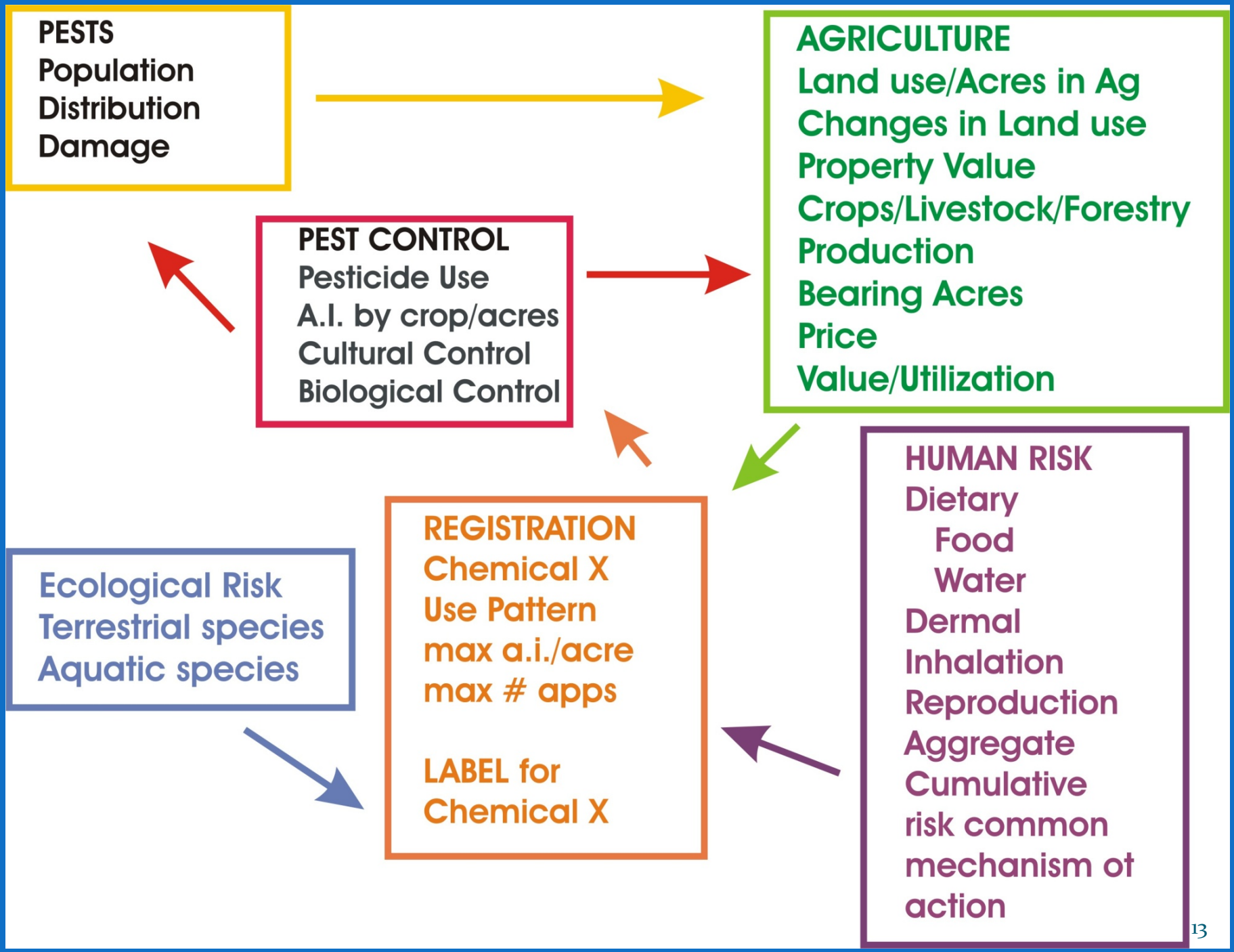
Registration of active ingredients

Single chemicals or at most groups of chemicals sharing the same common mechanism of action

Periodic review of registrations

Little analysis of changes in market for chemicals as result of cancellation of other chemicals

Little analysis of changes in pest pressure due to cancellation of chemicals


PESTS
Population
Distribution
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Land use/Acres in Ag
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PEST CONTROL
Pesticide Use
A.I. by crop/acres
Cultural Control
Biological Control
HUMAN RISK
Dietary
Food
Water
Dermal
Inhalation
Reproduction
Aggregate
Cumulative
risk common
mechanism ot
action
REGISTRATION
Chemical X
Use Pattern
max a.i./acre
max # apps
LABEL for
Chemical X
Ecological Risk
Terrestrial species
Aquatic species

Farming in the Pacific Northwest

- Nationwide leader in production of some fruits
- Growers determine what crops are grown on their land
- Growers provide nutrients and water
- Crop production may be impacted by pests
- Crop protection products, including pesticides, may be required to reduce crop losses and ensure foreign market access

Pesticide Application by Season

Cutworms	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Chlorpyrifos *								
Endosulfon *								
Indoxacarb								
Methoxyfenozide								

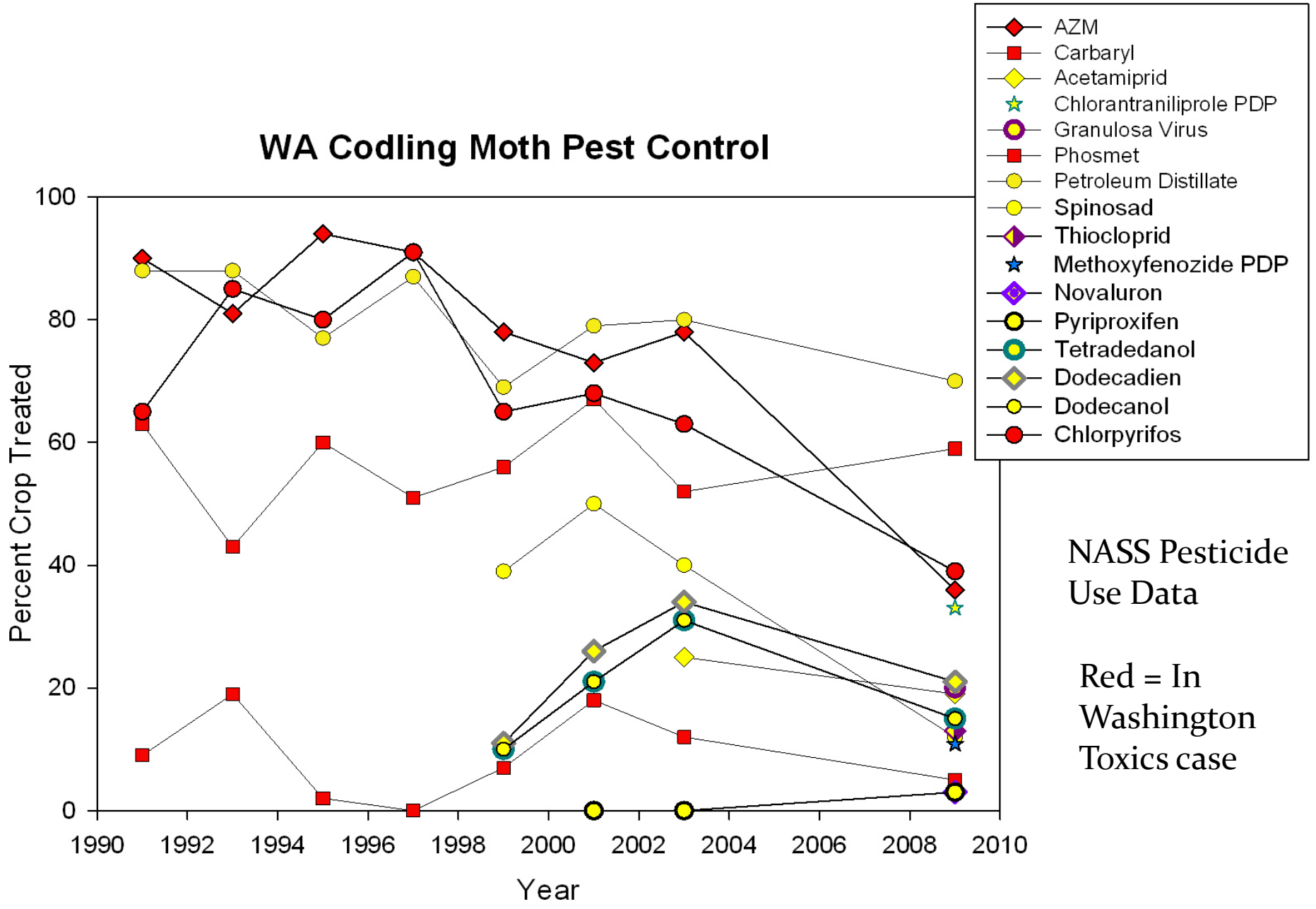
Apple Maggot Horticultural Pest	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Acetamiprid								
Azinphos methyl *								
Phosmet *								

* In the Washington Toxics case

Pesticide Application by Season

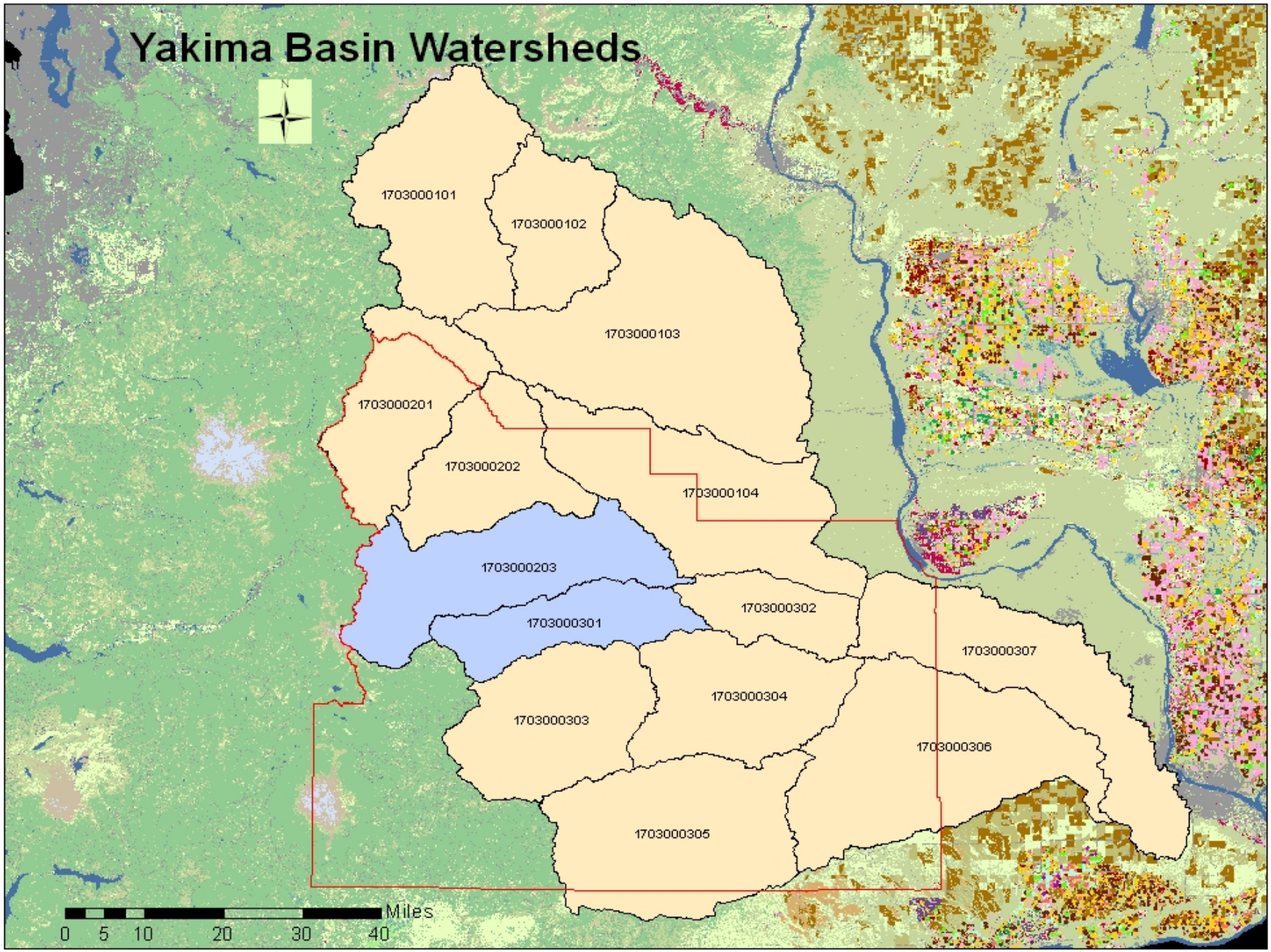
Codling Moth Horticultural Pest	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Pheromone								
Acetamiprid/ Petroleum oil								
Petroleum Oil								
Spinetoram								
Chlorantronilprole								
Azinphos methyl*								
Thiacloprid								
Phosmet*								

* In the Washington Toxics case

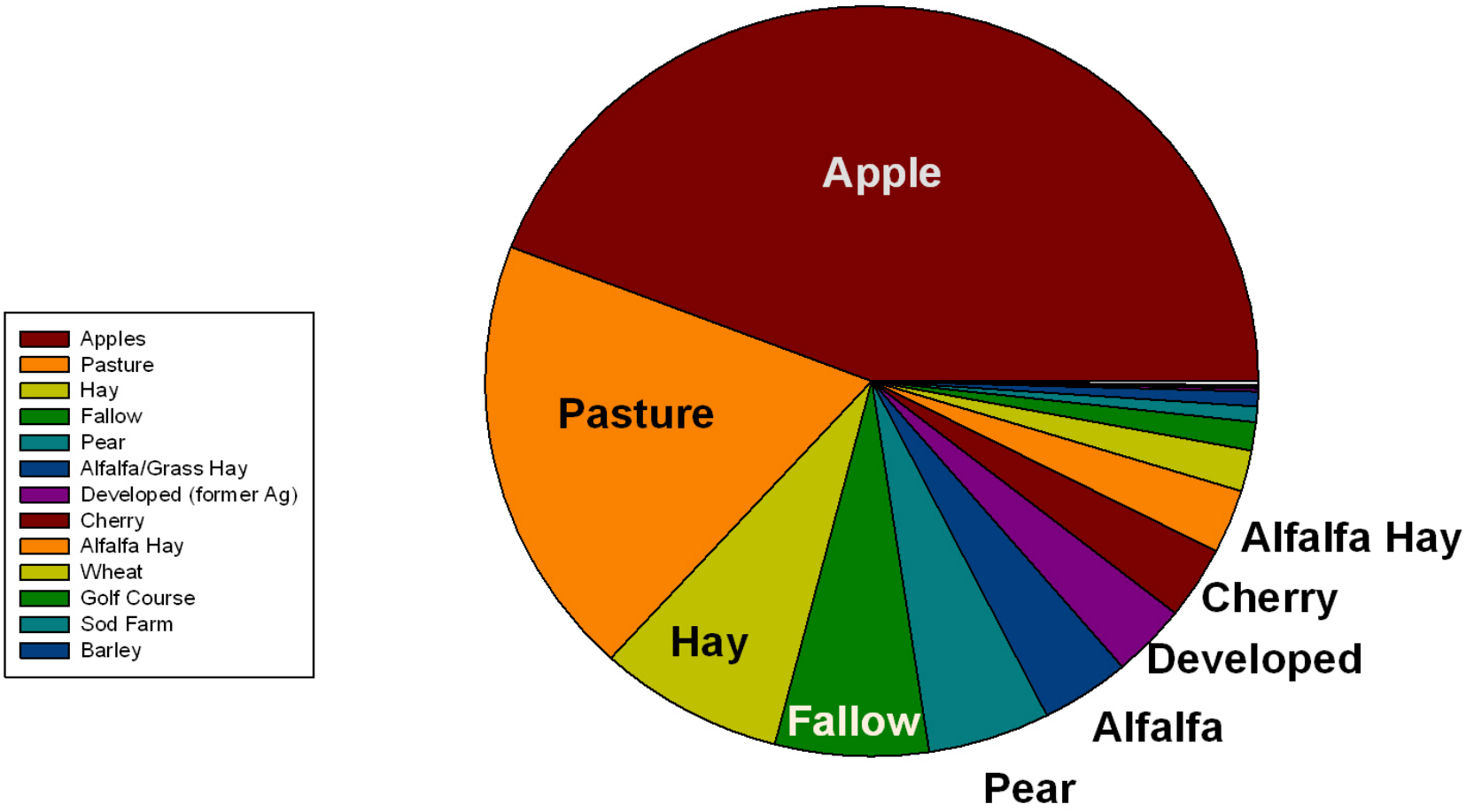


NASS Pesticide Use Data

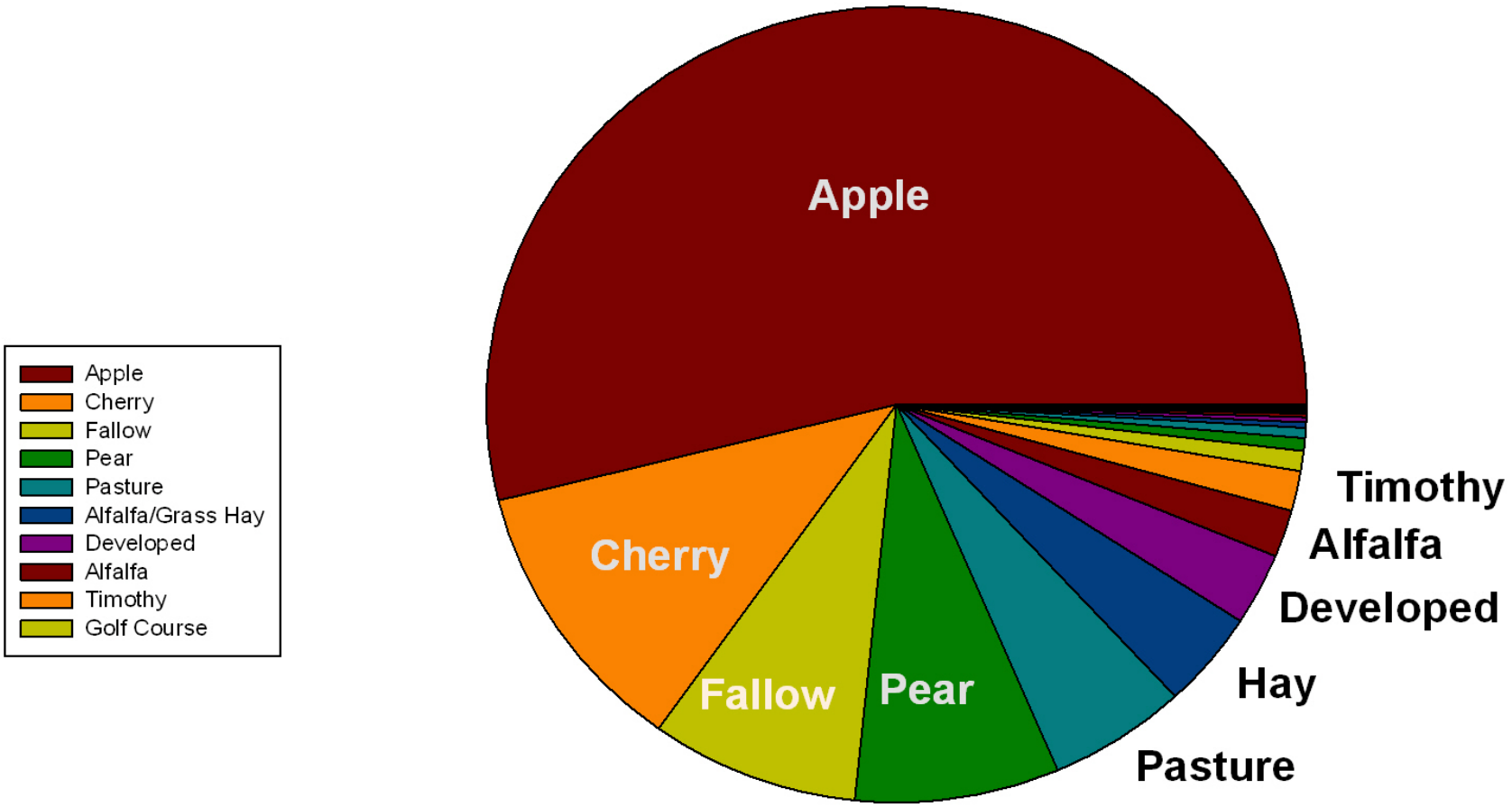
Red = In Washington Toxics case

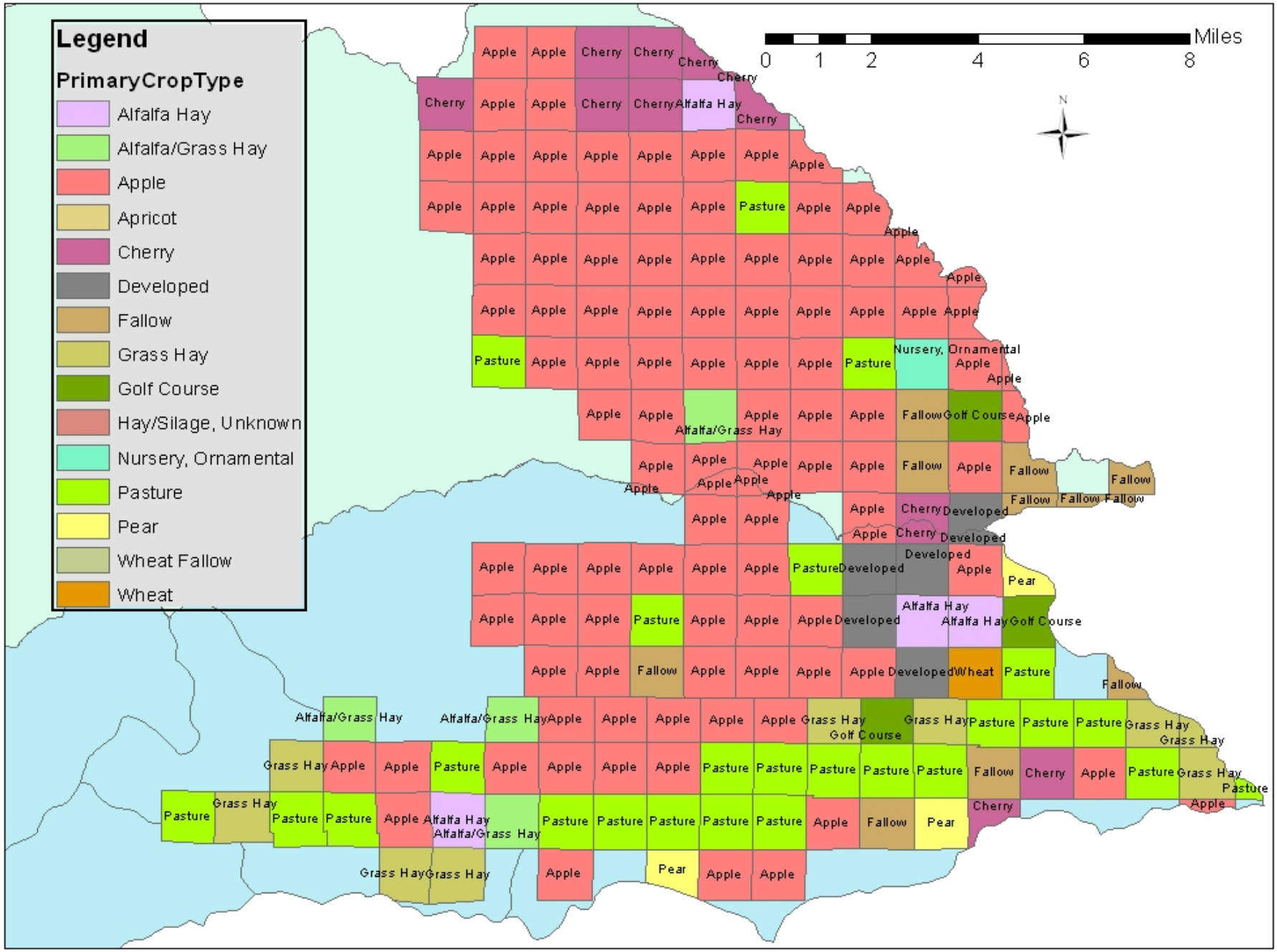

Yakima Basin Watersheds
1703000101
1703000102
1703000103
1703000201
1703000202
1703000104
1703000203
1703000301
1703000302
1703000307
1703000304
1703000303
1703000306
1703000305
Miles
0 5 10 20 30 40

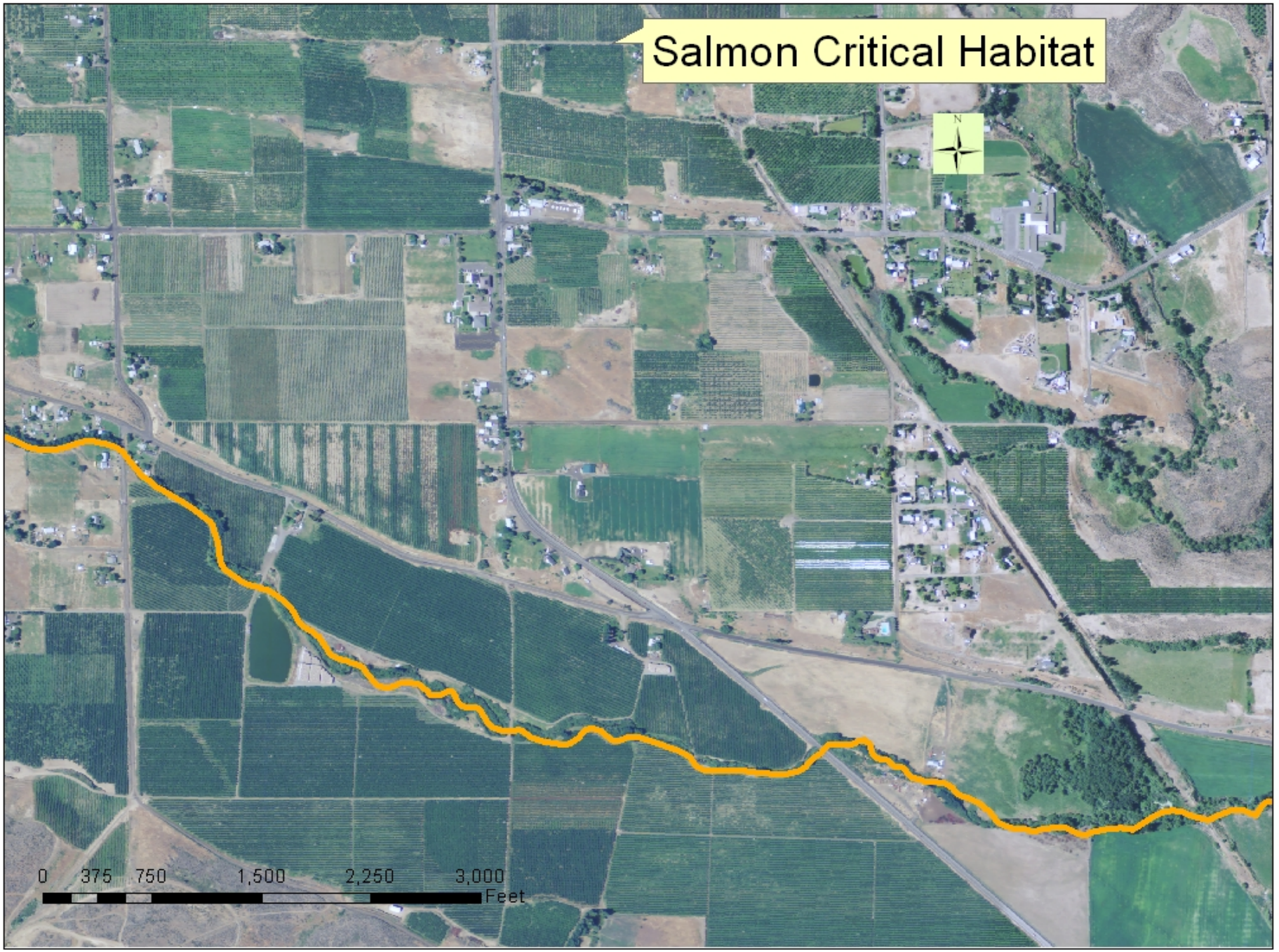
Yakima (301) Agricultural Land Use
(2010 WA Dept Ag Survey)



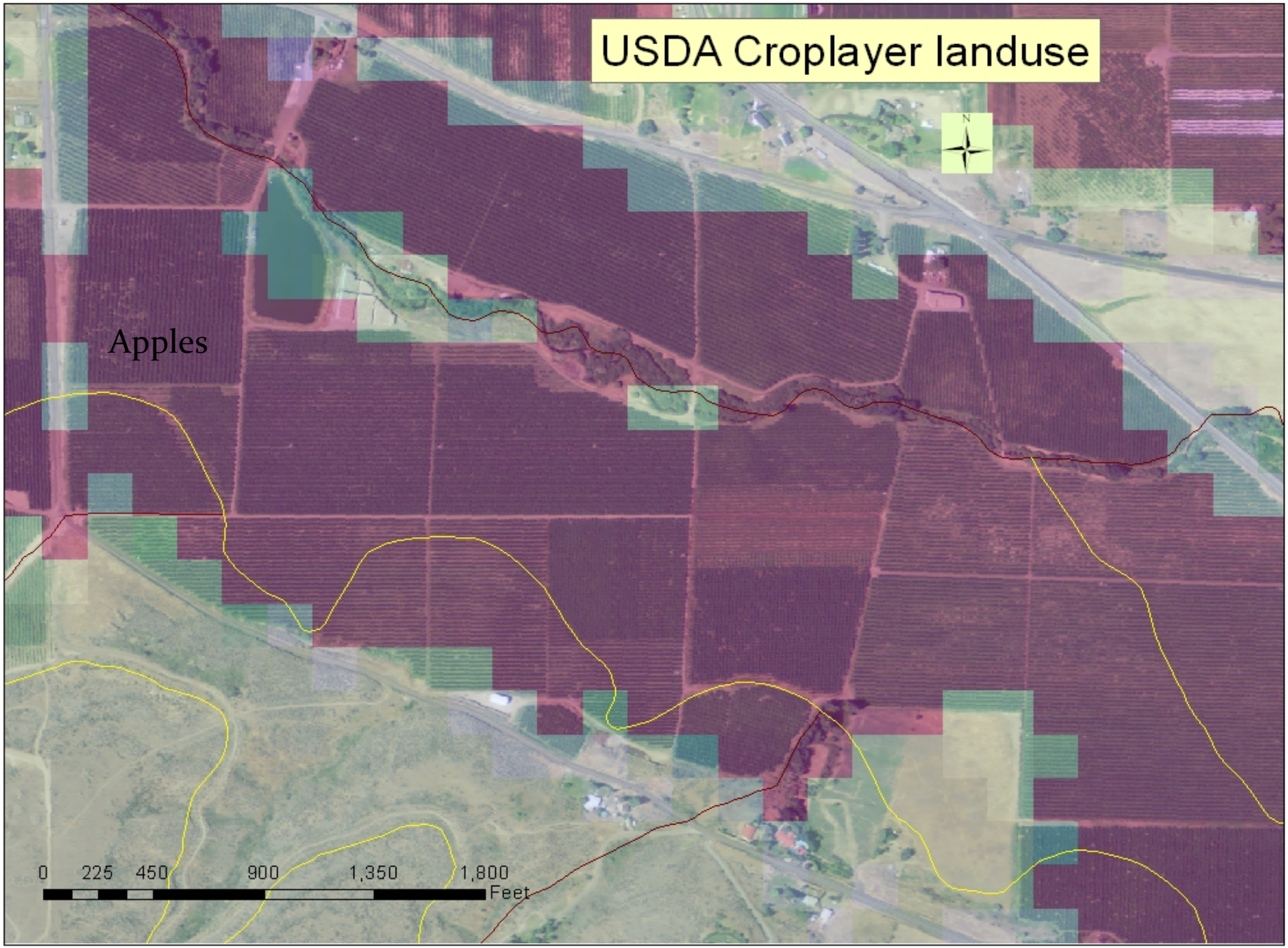
Naches (203) Agricultural Land Use
(2010 WA Dept. Agriculture Survey)

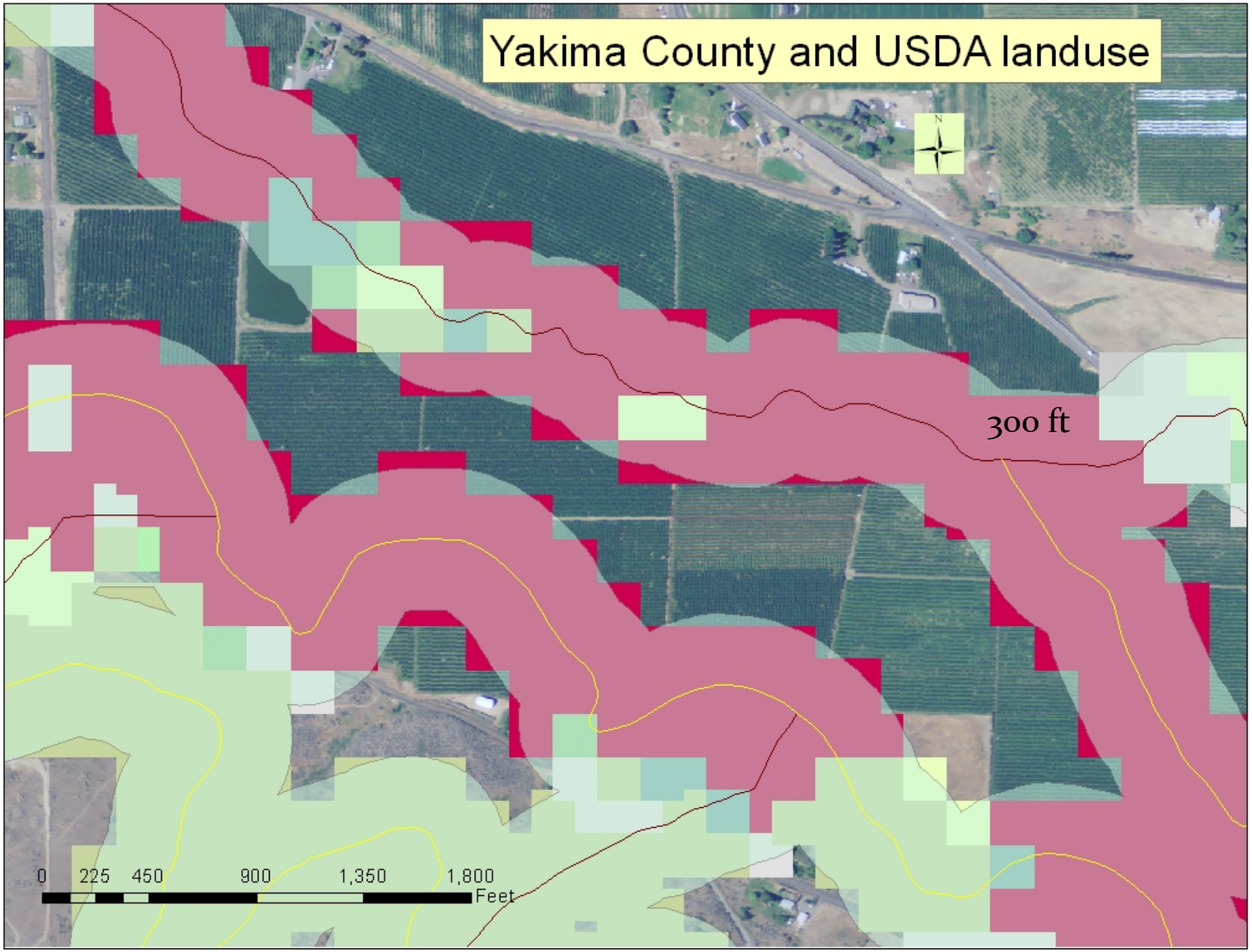


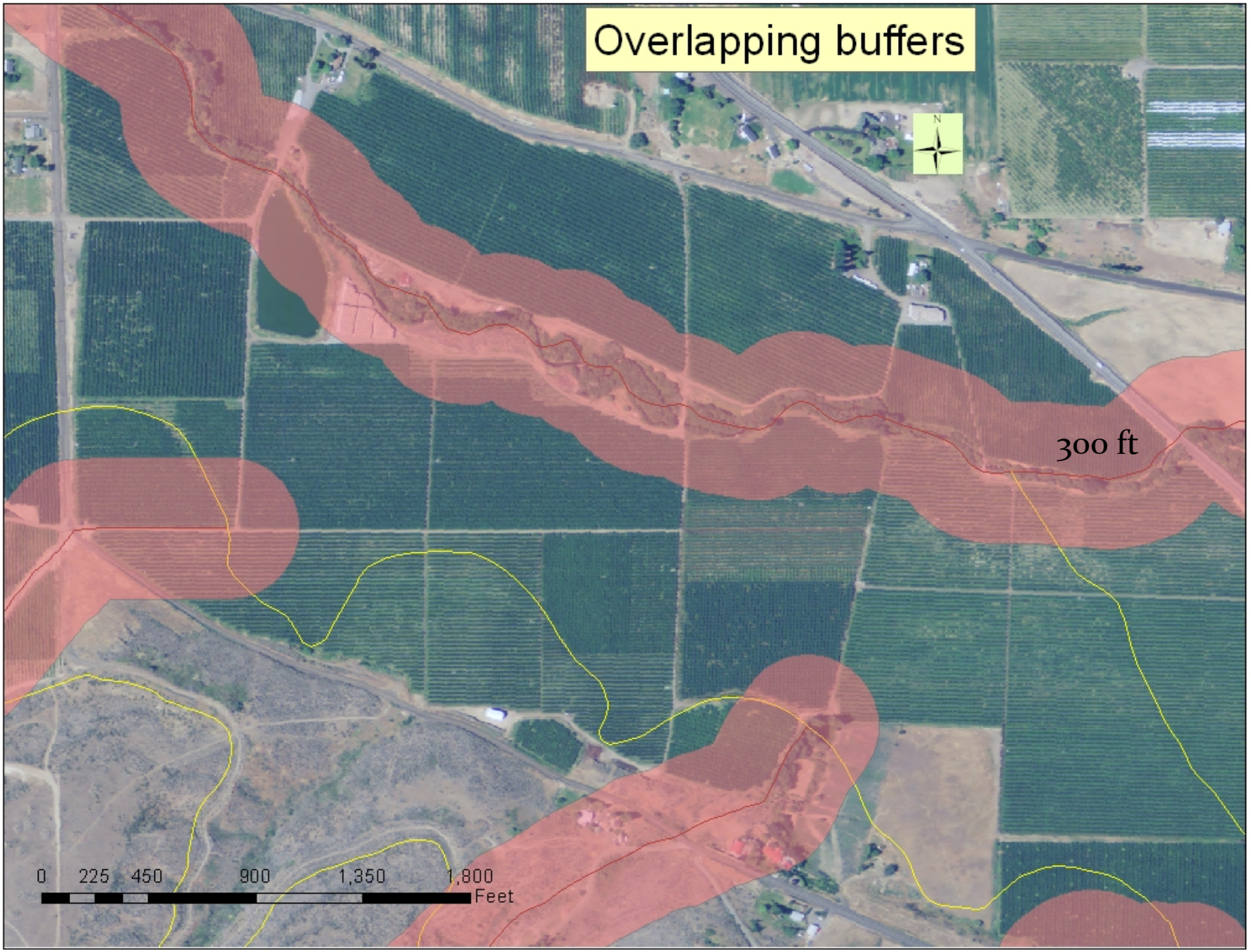

Legend
PrimaryCropType
Alfalfa Hay
Alfalfa/Grass Hay
Apple
Apricot
Cherry
Developed
Fallow
Grass Hay
Golf Course
Hay/Silage, Unknown
Nursery, Ornamental
Pasture
Pear
Wheat Fallow
Wheat
Miles
0 1 2 4 6 8
N

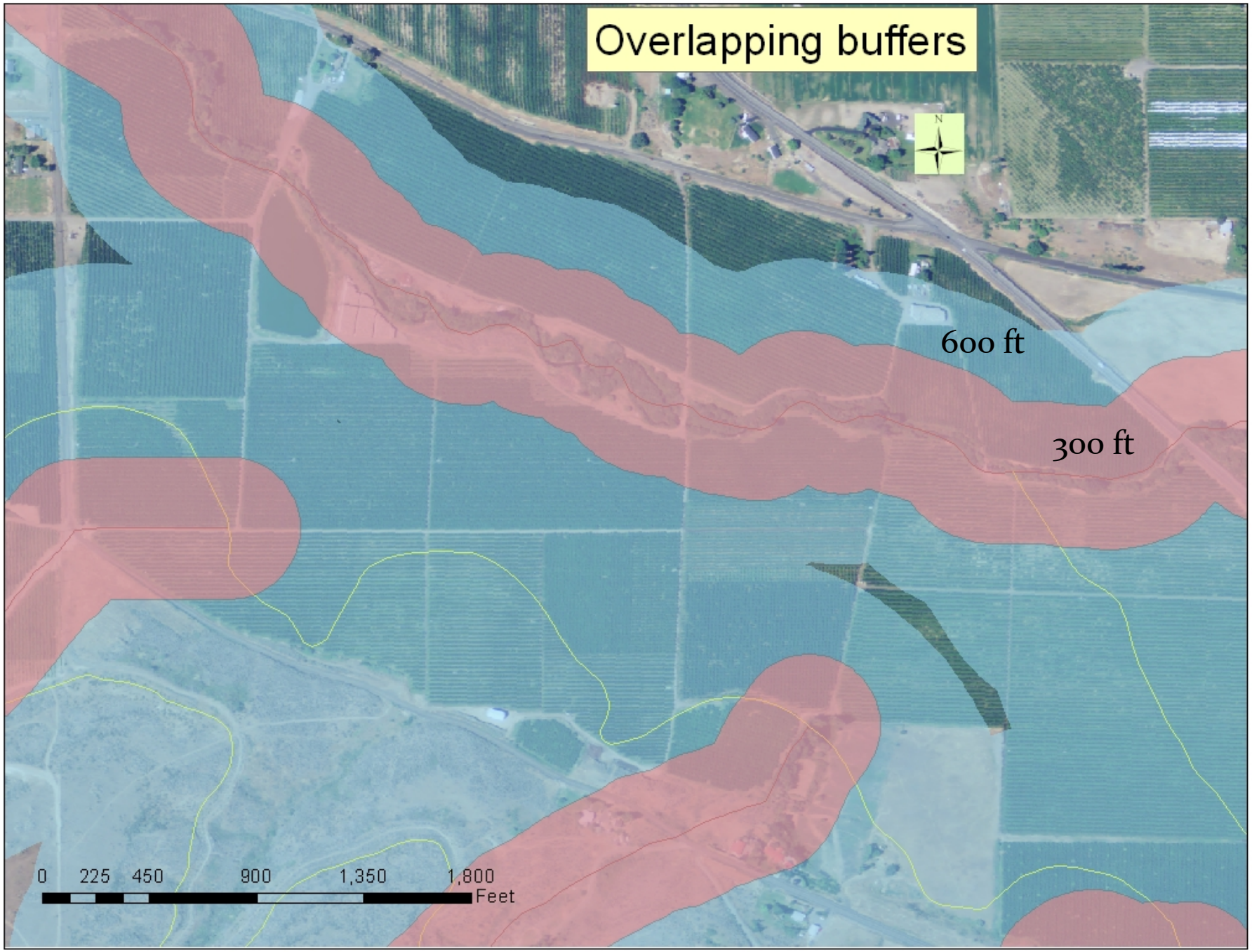

Salmon Critical Habitat
N
0 375 750 1,500 2,250 3,000
Feet

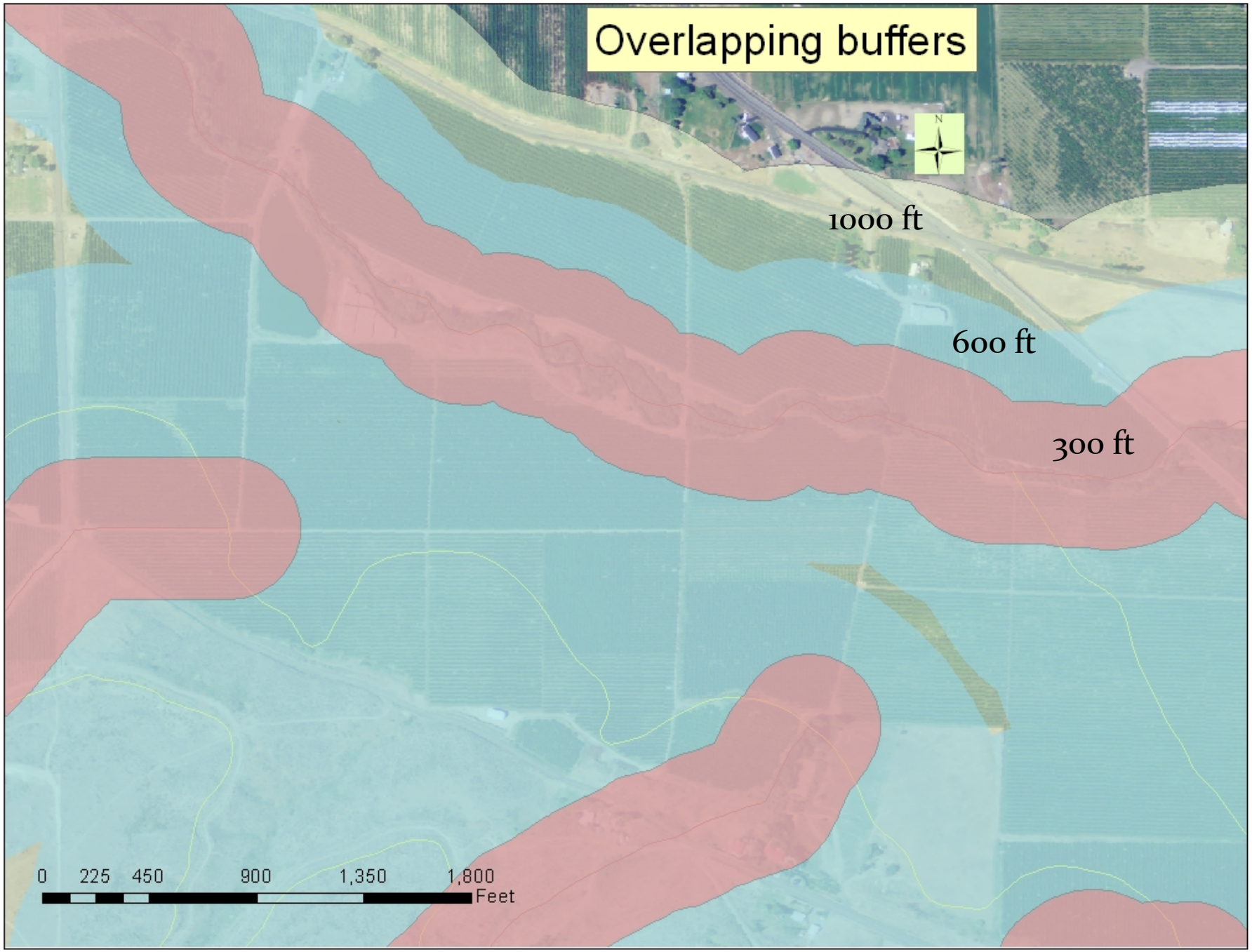

All Streams and Ditches
N
Stream
Ditch
0 375 750 1,500 2,250 3,000
Feet

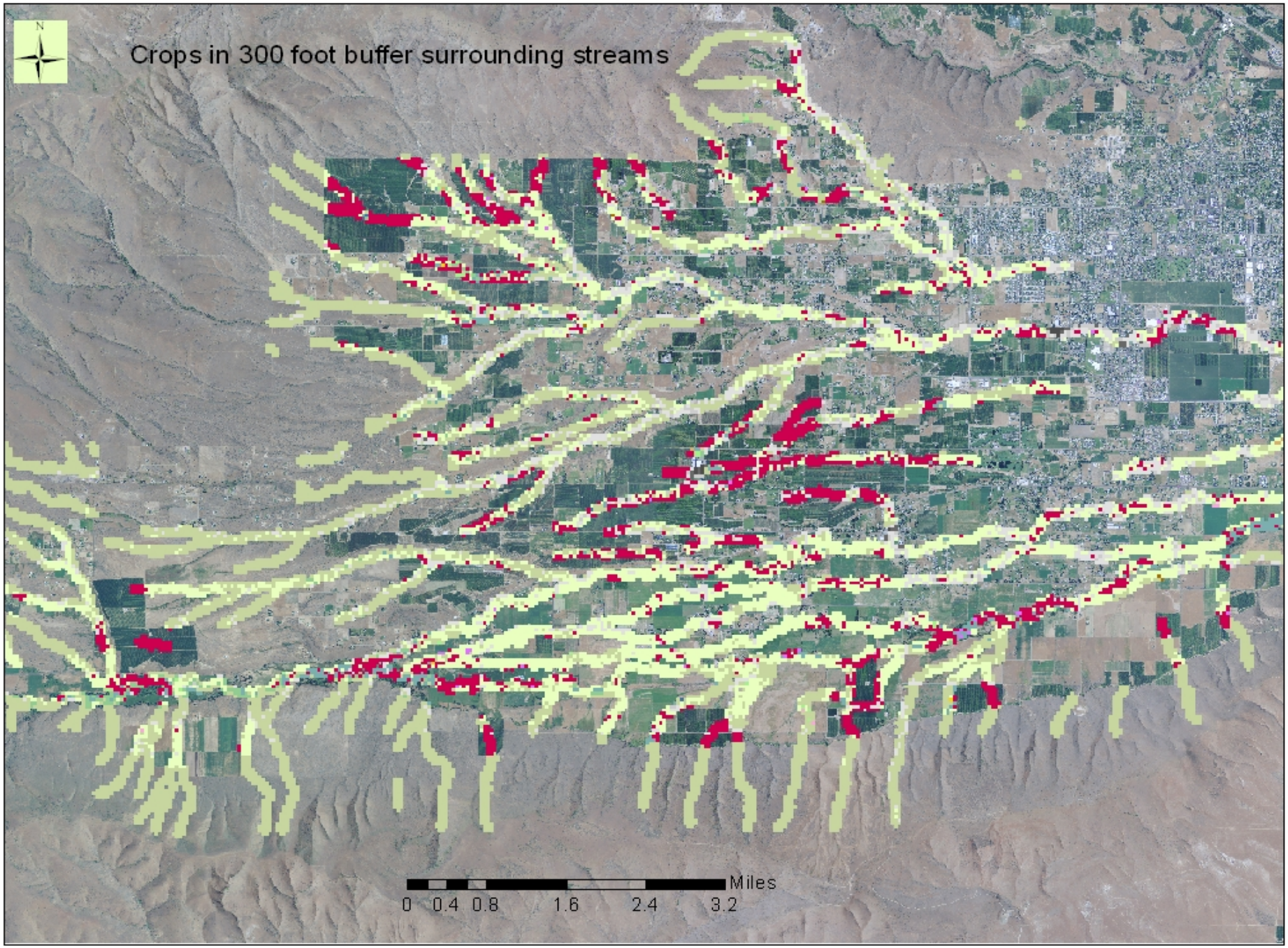

USDA Croplayer landuse
Apples
N
0 225 450 900 1,350 1,800
Feet

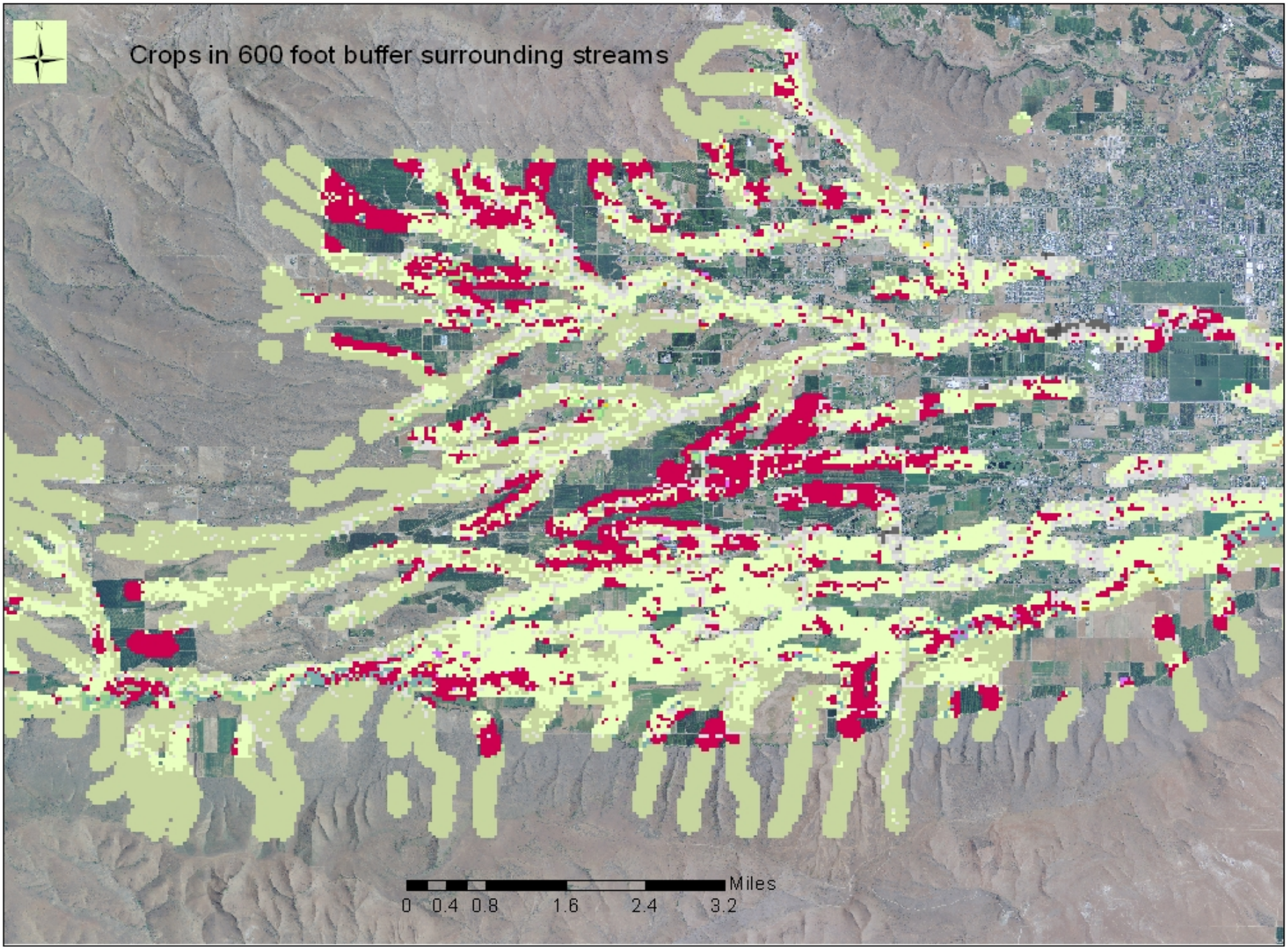

Yakima County and USDA landuse
300 ft
0 225 450 900 1,350 1,800
Feet

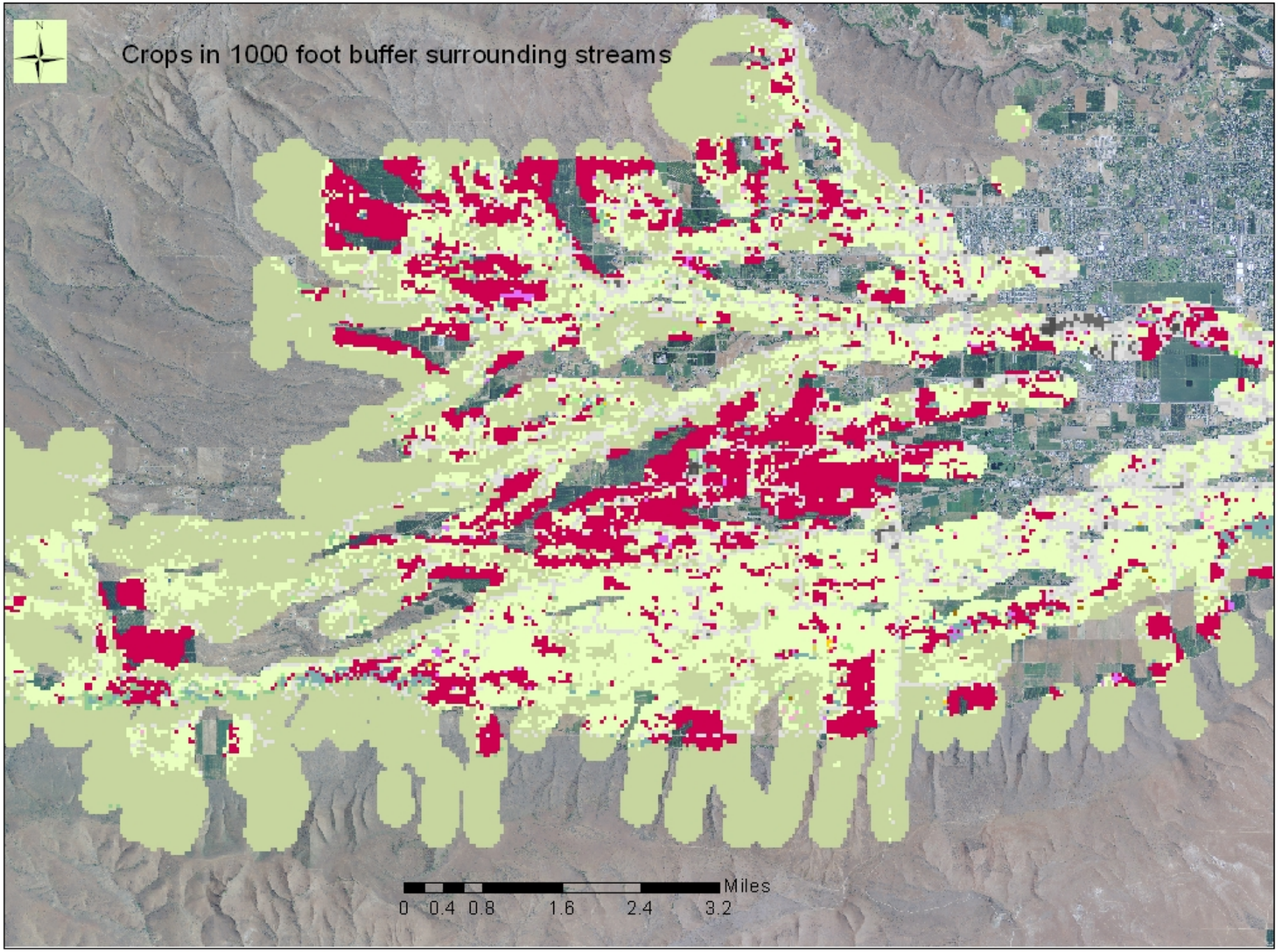

Overlapping buffers
N
300 ft
0 225 450 900 1,350 1,800
Feet

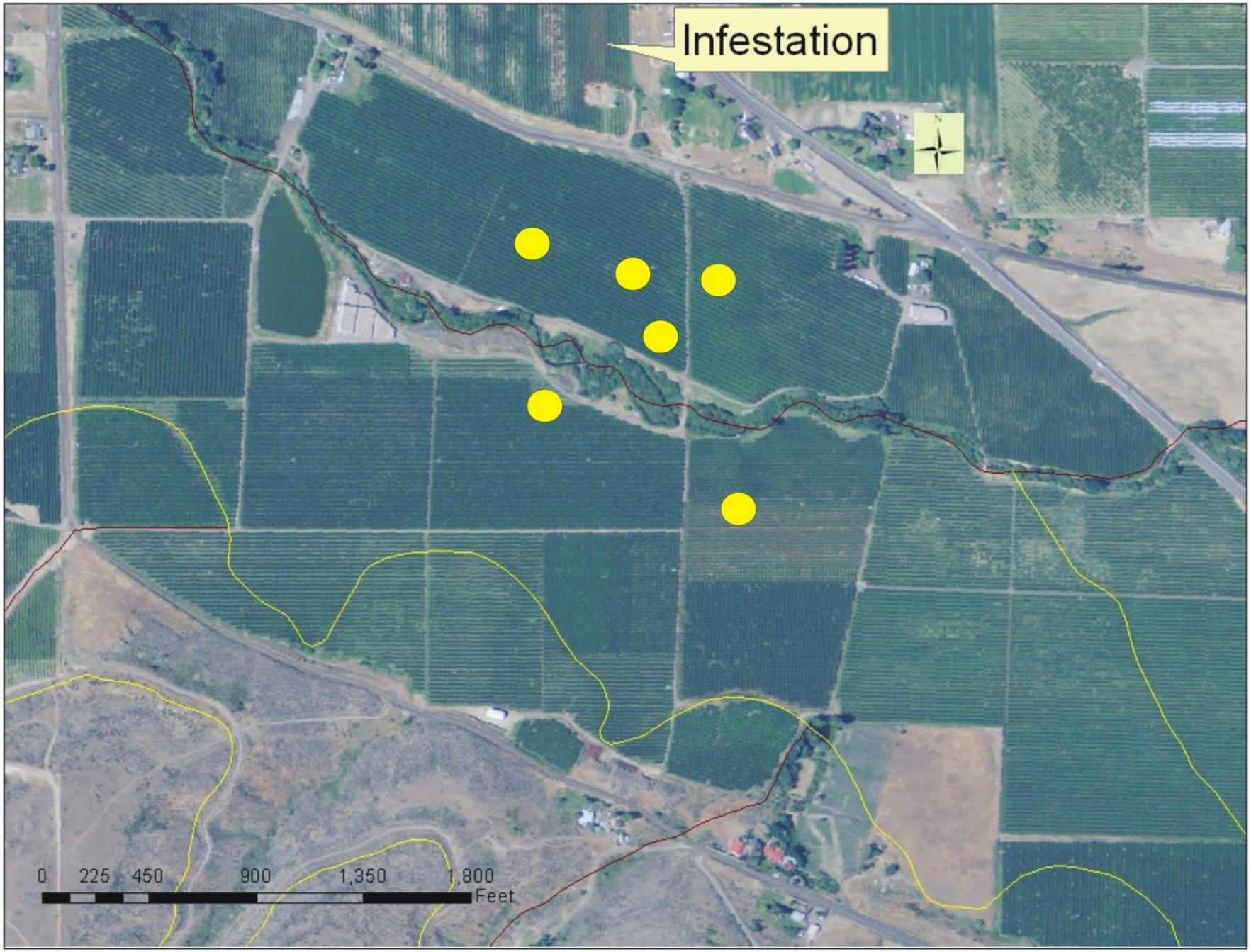

Overlapping buffers
N
600 ft
300 ft
0 225 450 900 1,350 1,800
Feet

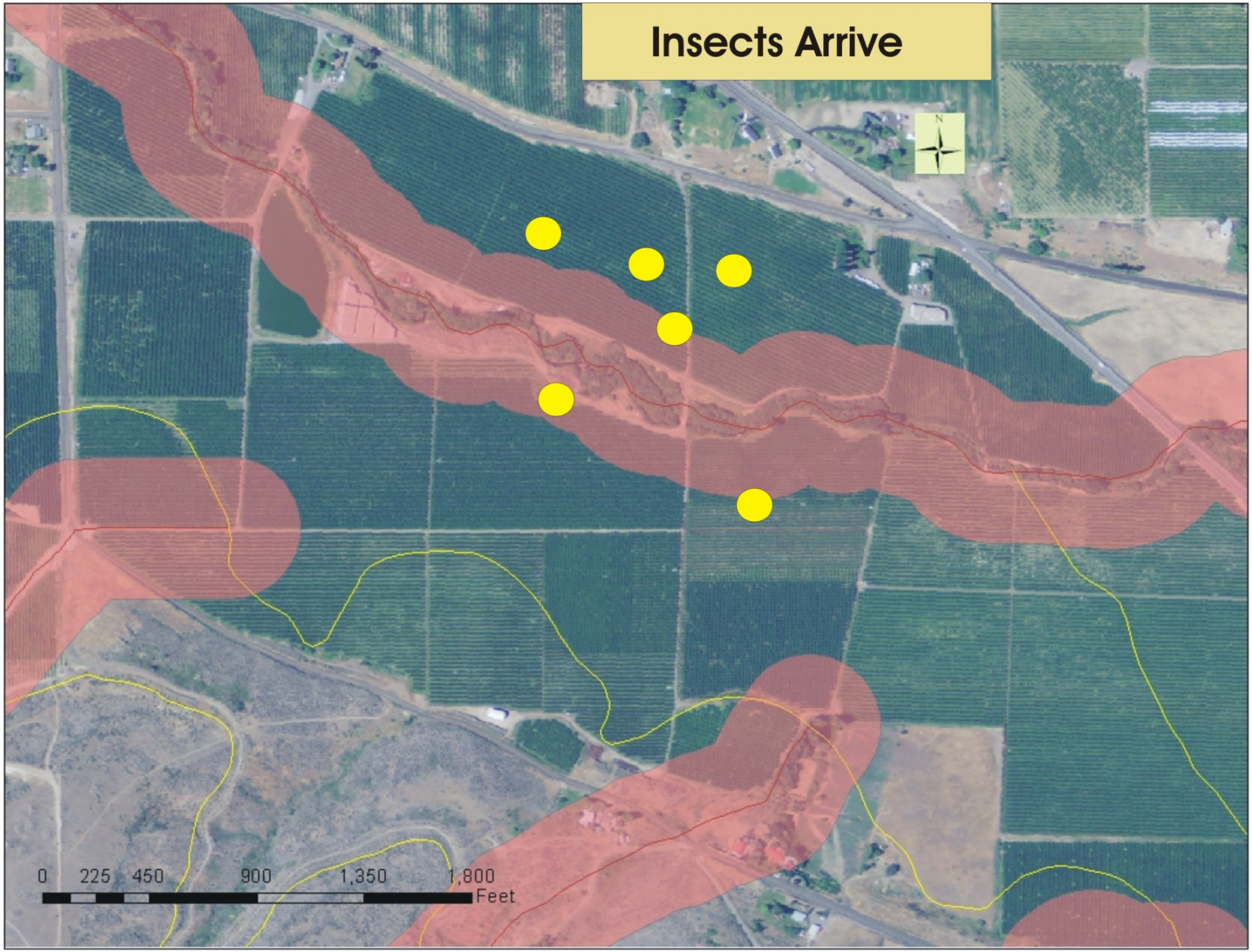

Overlapping buffers
N
1000 ft
600 ft
300 ft
0 225 450 900 1,350 1,800
Feet

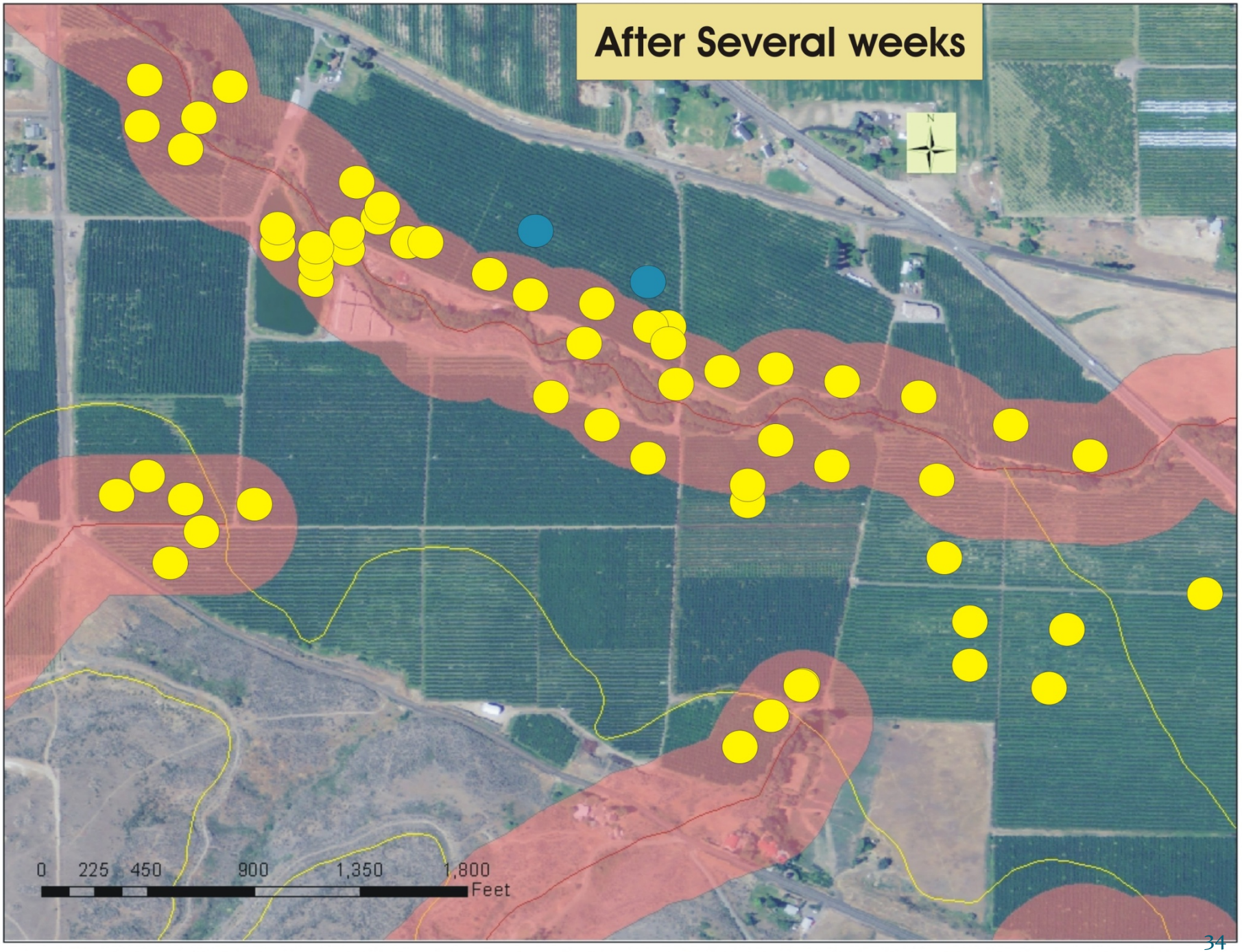

Crops in 300 foot buffer surrounding streams
N
Miles
0 0.4 0.8 1.6 2.4 3.2


Crops in 600 foot buffer surrounding streams
Miles
0 0.4 0.8 1.6 2.4 3.2


N
Crops in 1000 foot buffer surrounding streams
Miles
0 0.4 0.8 1.6 2.4 3.2


Infestation
N
0
225
450
900
1,350
1,800
Feet

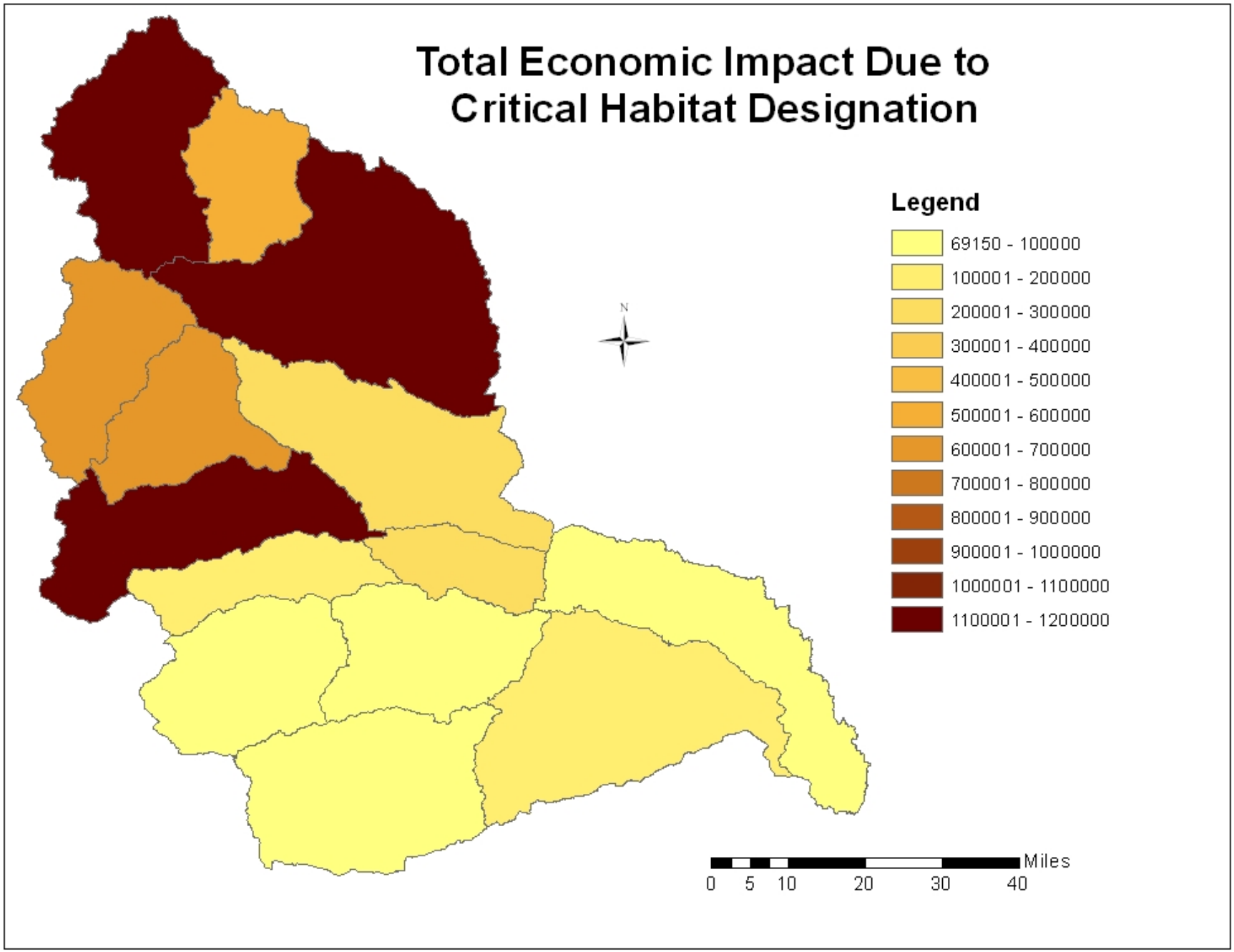

Insects Arrive
N
0
225
450
900
1,350
1,800
Feet

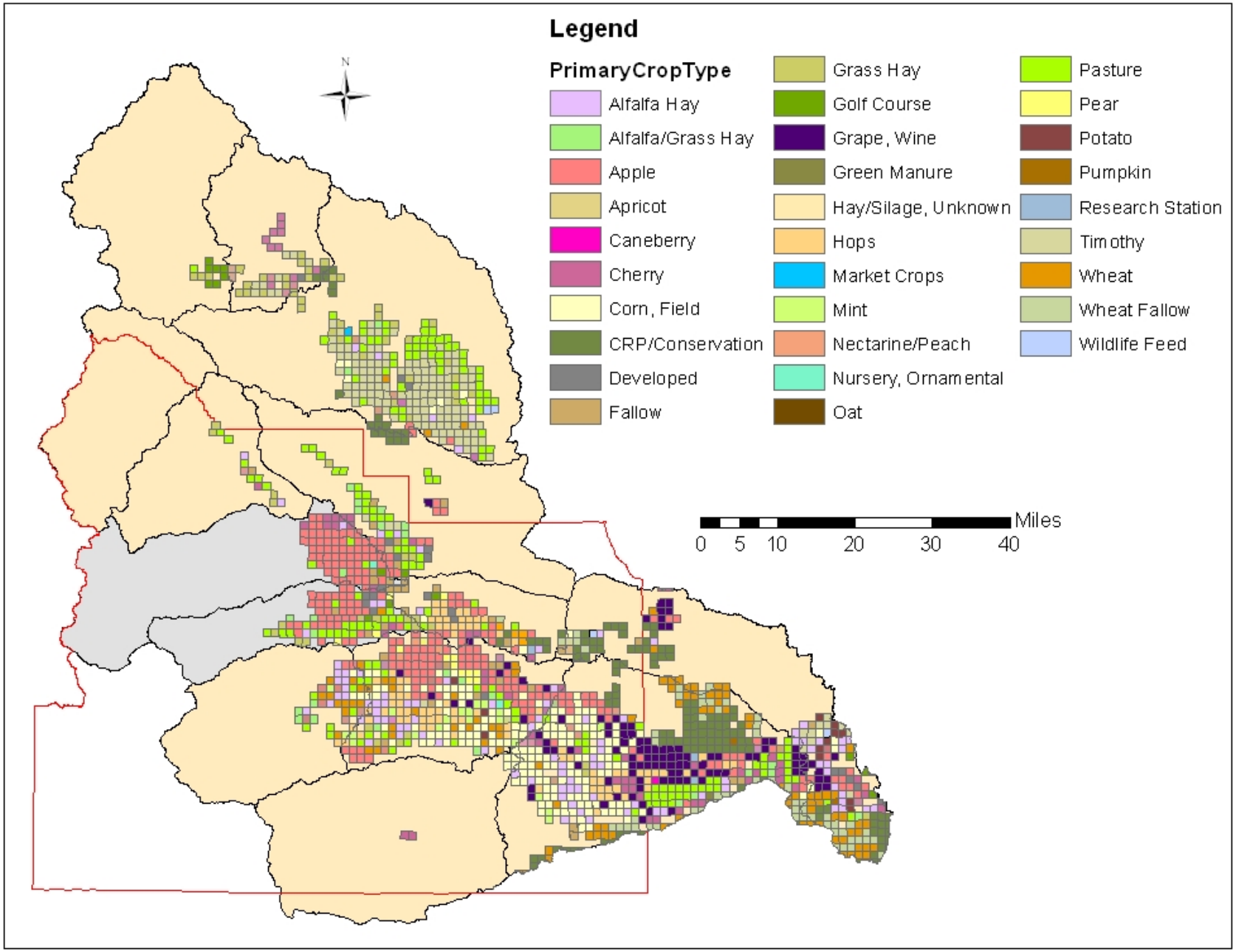

After Several weeks
N
0
225
450
900
1,350
1,800
Feet

2005 Economic Analysis for Designation of Critical Habitat

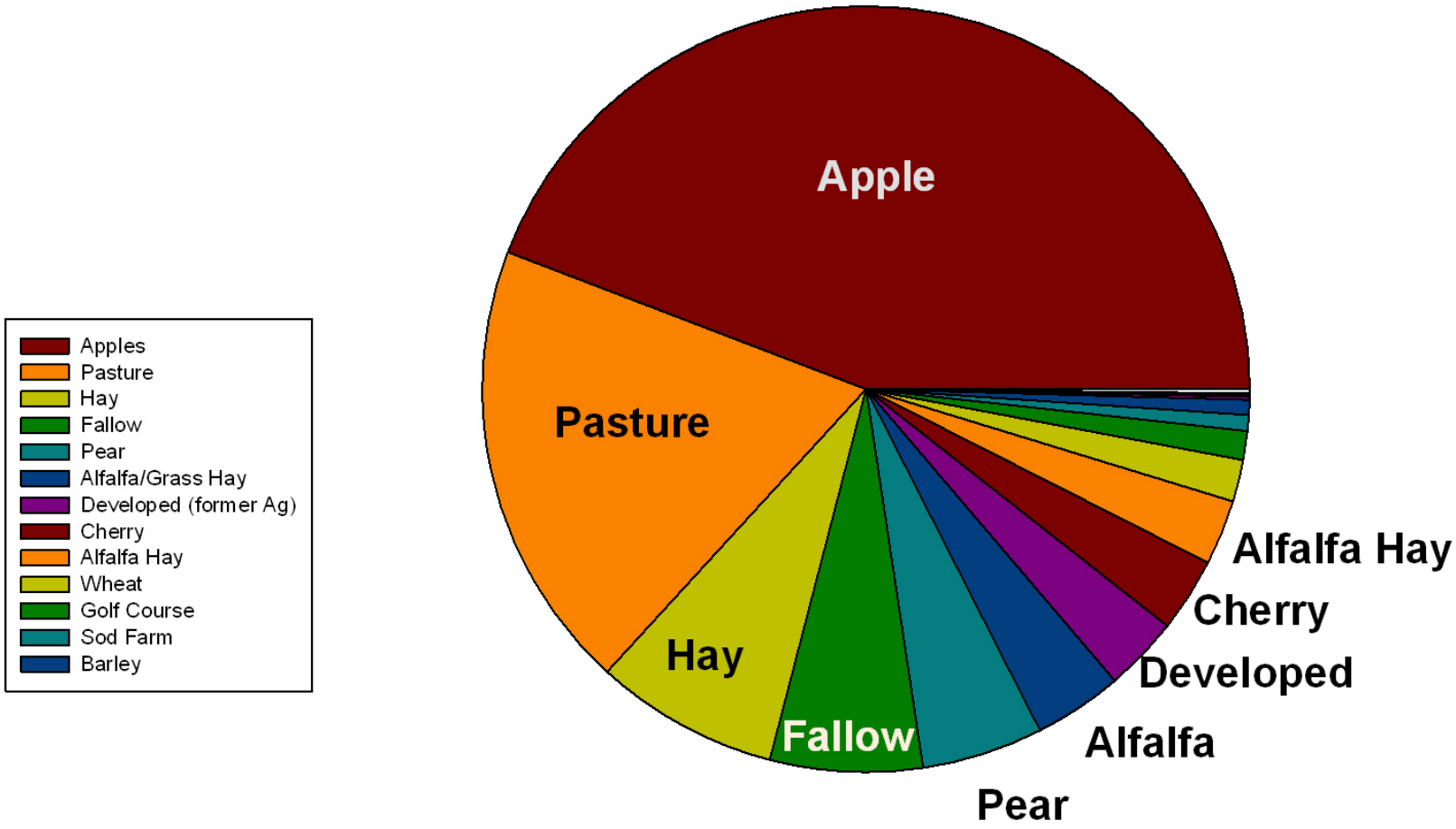
- Estimated Economic Impacts for 13 Activity Types:

- Hydropower Dams
- Non-hydropower Dams
- Federal land management
- Federal land management (wilderness)
- Grazing
- Transportation Projects
- Utility Projects
- Sand & Gravel Operations
- Instream Activities
- Dredging
- Residential & Commercial Development
- NPDES Activities
- **Pesticides**

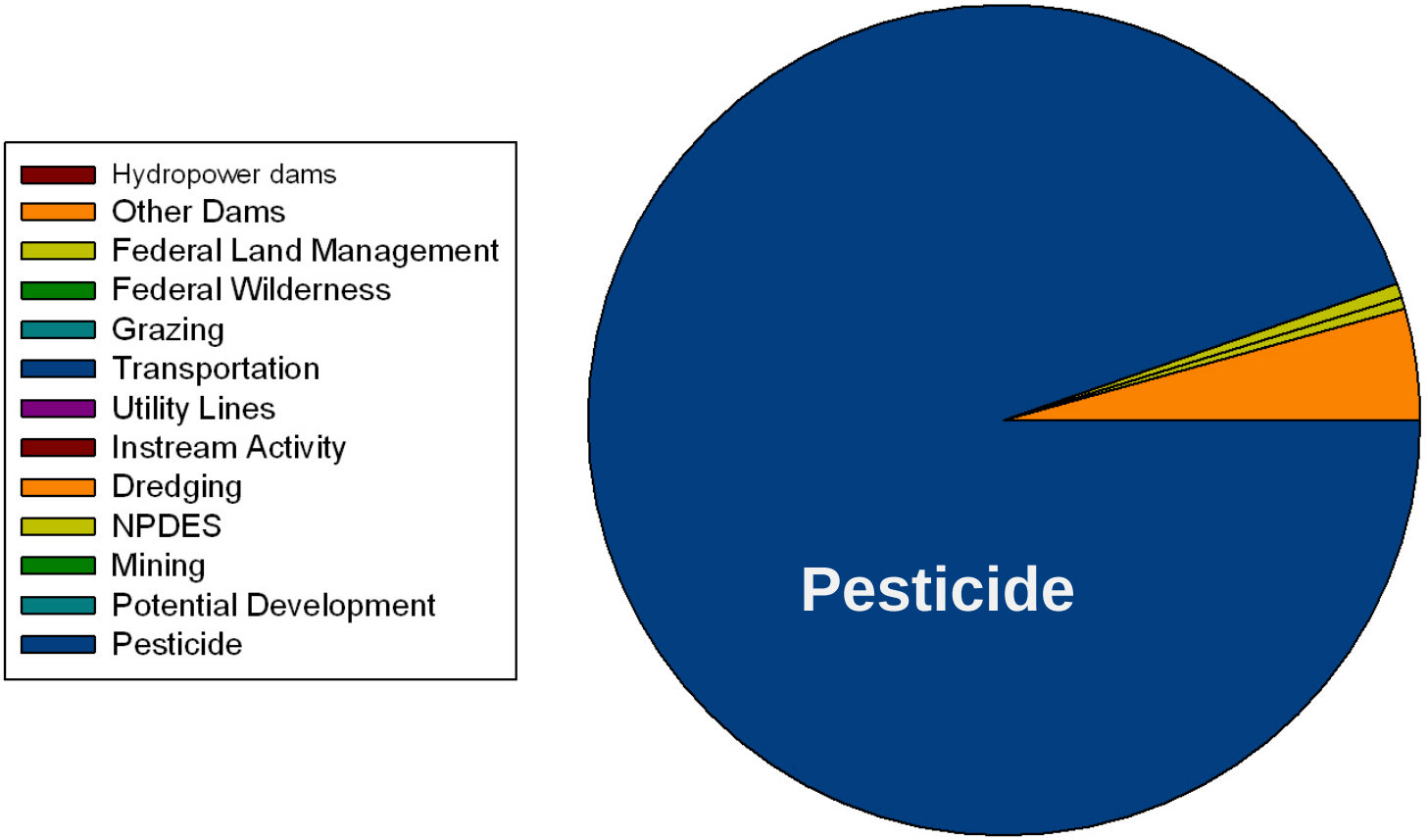

Total Economic Impact Due to Critical Habitat Designation
Legend
69150 - 100000
100001 - 200000
200001 - 300000
300001 - 400000
400001 - 500000
500001 - 600000
600001 - 700000
700001 - 800000
800001 - 900000
900001 - 1000000
1000001 - 1100000
1100001 - 1200000
N
Miles
0 5 10 20 30 40


Legend
PrimaryCropType
Alfalfa Hay
Alfalfa/Grass Hay
Apple
Apricot
Caneberry
Cherry
Corn, Field
CRP/Conservation
Developed
Fallow
Grass Hay
Golf Course
Grape, Wine
Green Manure
Hay/Silage, Unknown
Hops
Market Crops
Mint
Nectarine/Peach
Nursery, Ornamental
Oat
Pasture
Pear
Potato
Pumpkin
Research Station
Timothy
Wheat
Wheat Fallow
Wildlife Feed
N
Miles
0 5 10 20 30 40

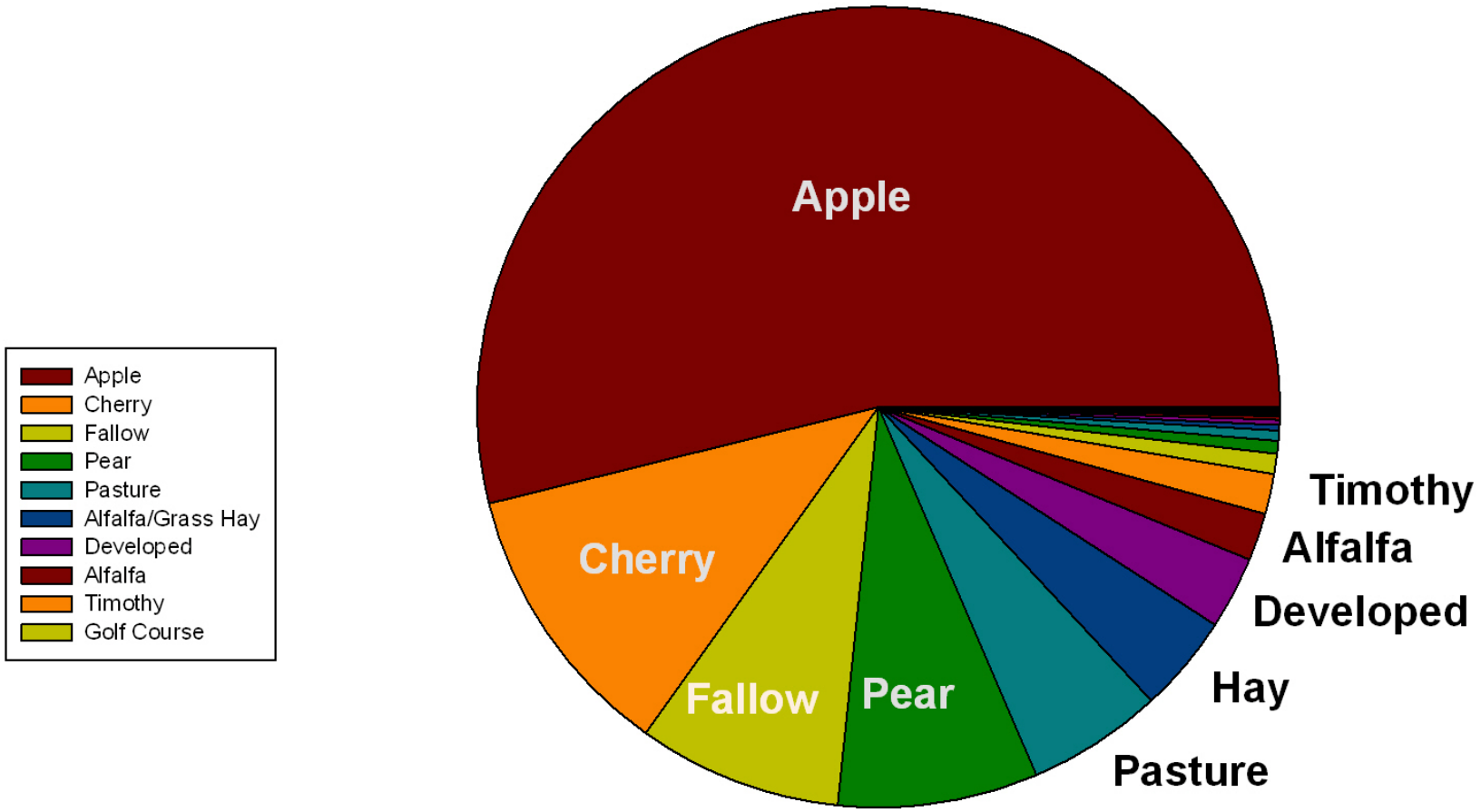
Yakima (301) Agricultural Land Use
(2010 WA Dept Ag Survey)



Yakima Relative Frequency of Costs by Category (Mid-Range with 7% discount rate)



Naches (203) Agricultural Land Use
(2010 WA Dept. Agriculture Survey)



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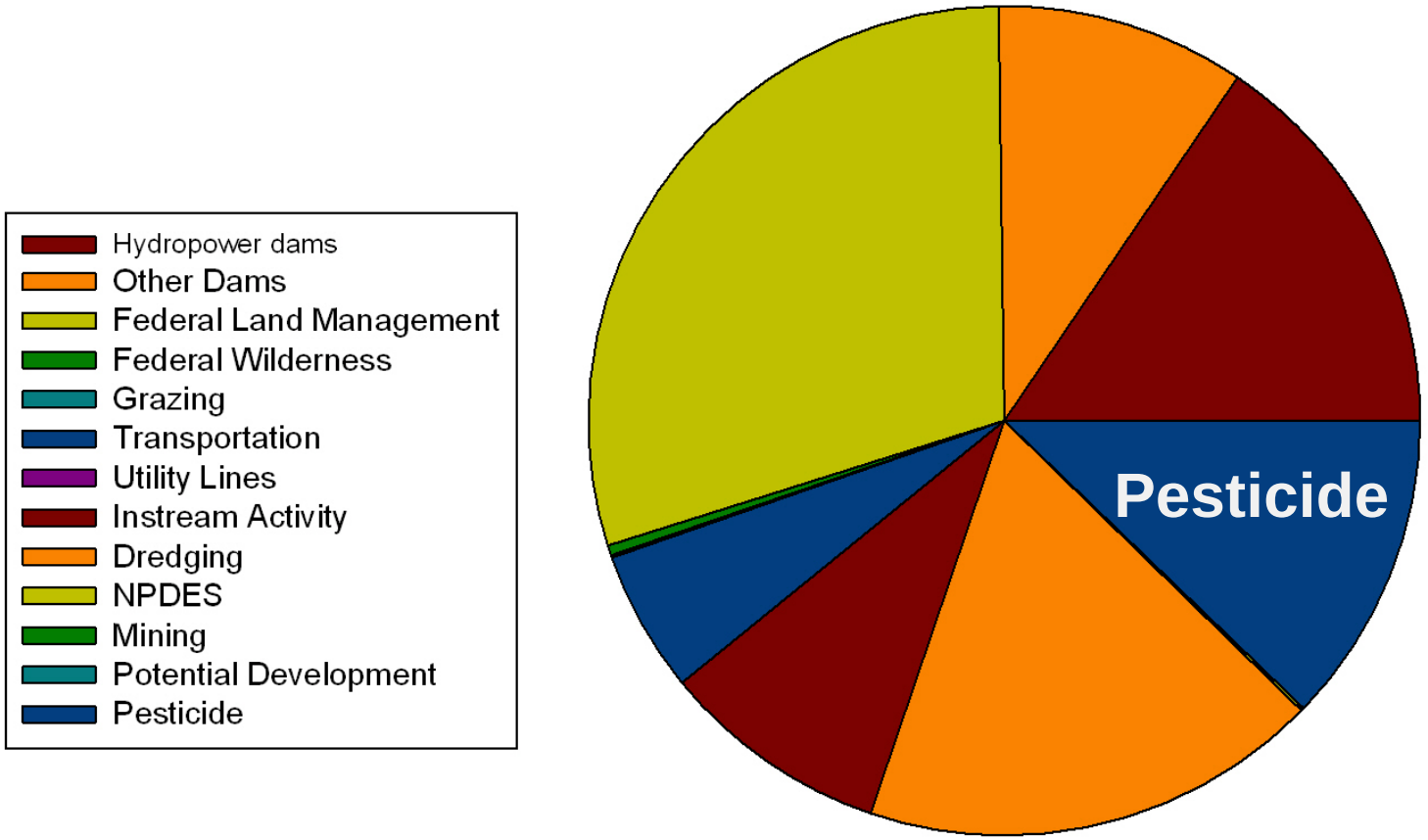


Entire Middle Columbia ESU Agricultural Land Lost to Buffers NMFS Economic Analysis

NMFS Acres in Buffers	60 ft	300 ft
Row Crops	482	2363
Small Grains	2615	13404
Orchards/Vineyards	764	3685

NMFS Draft Economic Analysis, 2004

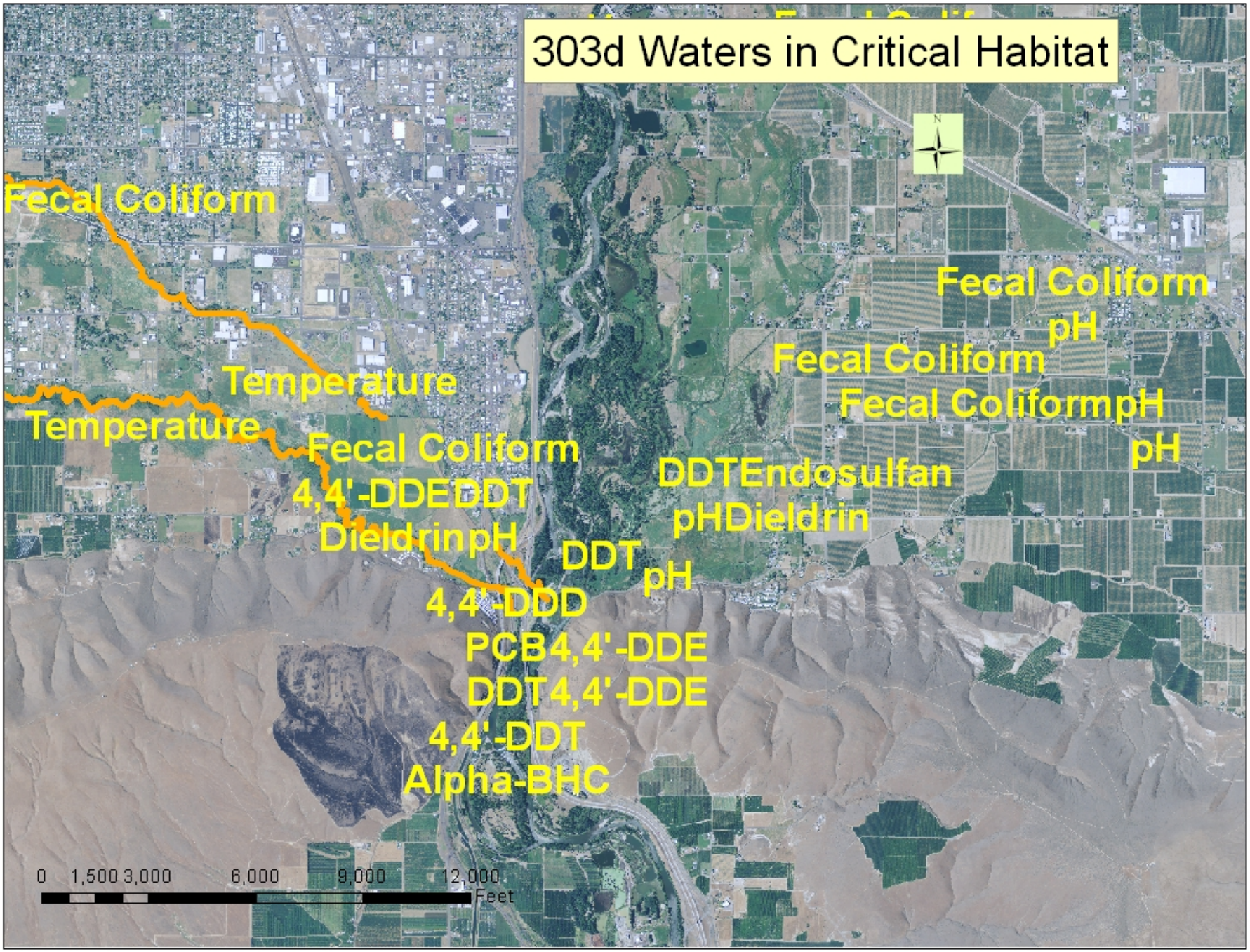
Total Agricultural Acres and Value by Watershed					
Crop	203 Acres	301 Acres	2010 Value Per Acre	203 Total Revenue	301 Total Revenue
Apples	11219	7063	$9,437	$105,873,703	$66,653,531
Cherries	2349	500	$9,830	$23,090,670	$4,915,000
Pears	1679	818	$9,810	$16,470,990	$8,024,580
Hay	821	1240	$537	$440,877	$665,880
Other	4759	6370	--	--	--
Total	20827	15991	--	$147,484,138	$81,283,930

301 Watershed Lost Revenue in Buffers			
Crop	300 ft	600 ft	1000 ft
Apples	$23,863,153	$44,783,378	$63,821,582
Cherries	$529,837	$1,089,950	$1,703,048
Pears	$1,291,683	$2,432,291	$3,580,454
Other	$60,122	$131,736	$213,360
Total	$25,744,795	$48,437,356	$69,318,443

Assuming total loss of year's revenue

203 Watershed Lost Revenue in Buffers			
Crop	300 ft	600 ft	1000 ft
Apples	$27,787,058	$51,359,551	$74,932,045
Cherries	$484,422	$908,292	$1,362,438
Pears	$589,189	$1,299,236	$1,790,227
Other	$41,944	$99,592	$141,242
Total	$28,902,613	$53,666,672	$78,225,952

Assuming total loss of year's revenue


303d Waters in Critical Habitat
Fecal Coliform
Temperature
Temperature
Fecal Coliform
4,4'-DDE
DDT
Dieldrin
pH
DDT
pH
4,4'-DDD
PCB
4,4'-DDE
DDT
4,4'-DDE
4,4'-DDT
Alpha-BHC
DDT
Endosulfan
pH
Dieldrin
Fecal Coliform
pH
Fecal Coliform
Fecal Coliform
pH
pH
0 1,500 3,000 6,000 9,000 12,000
Feet

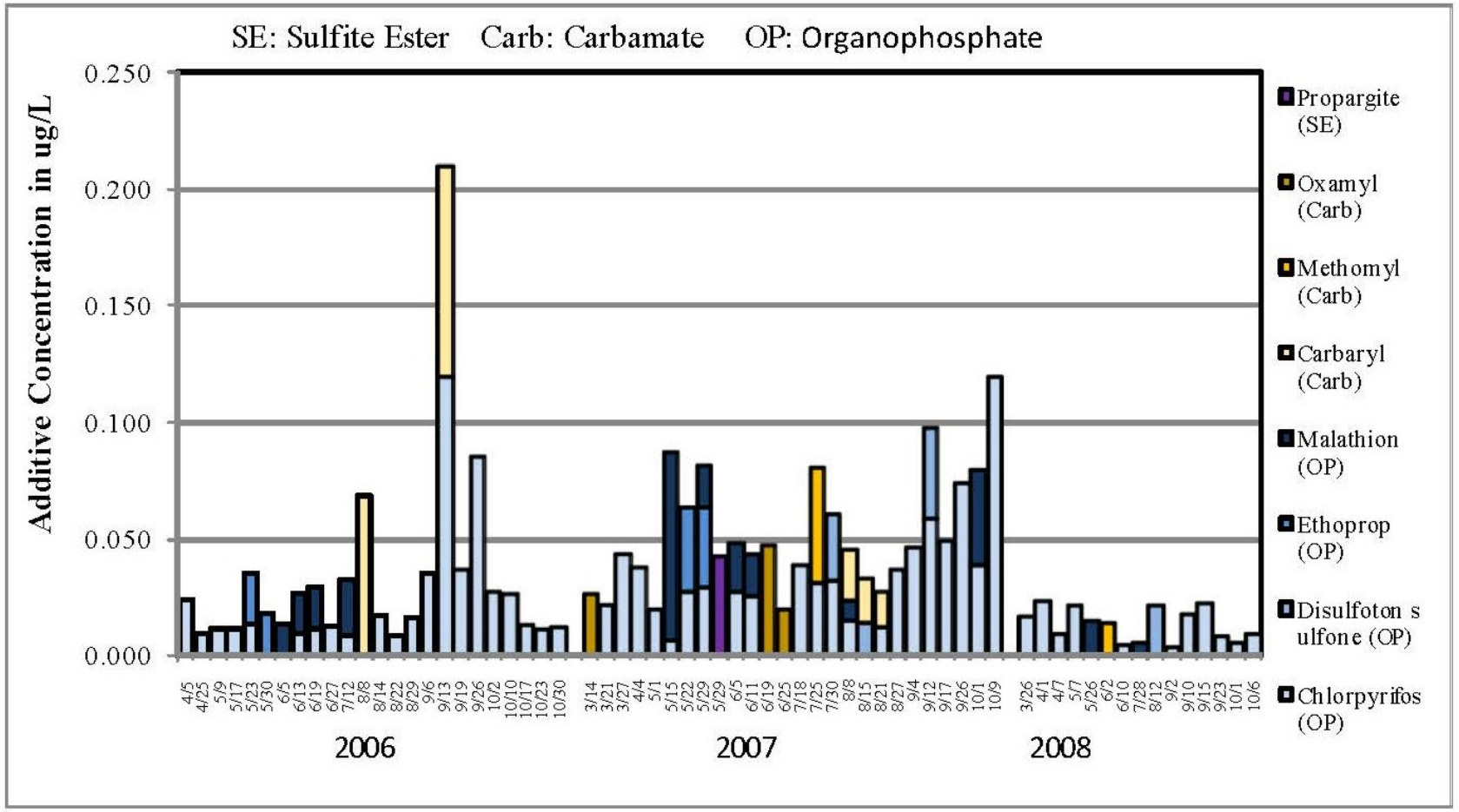
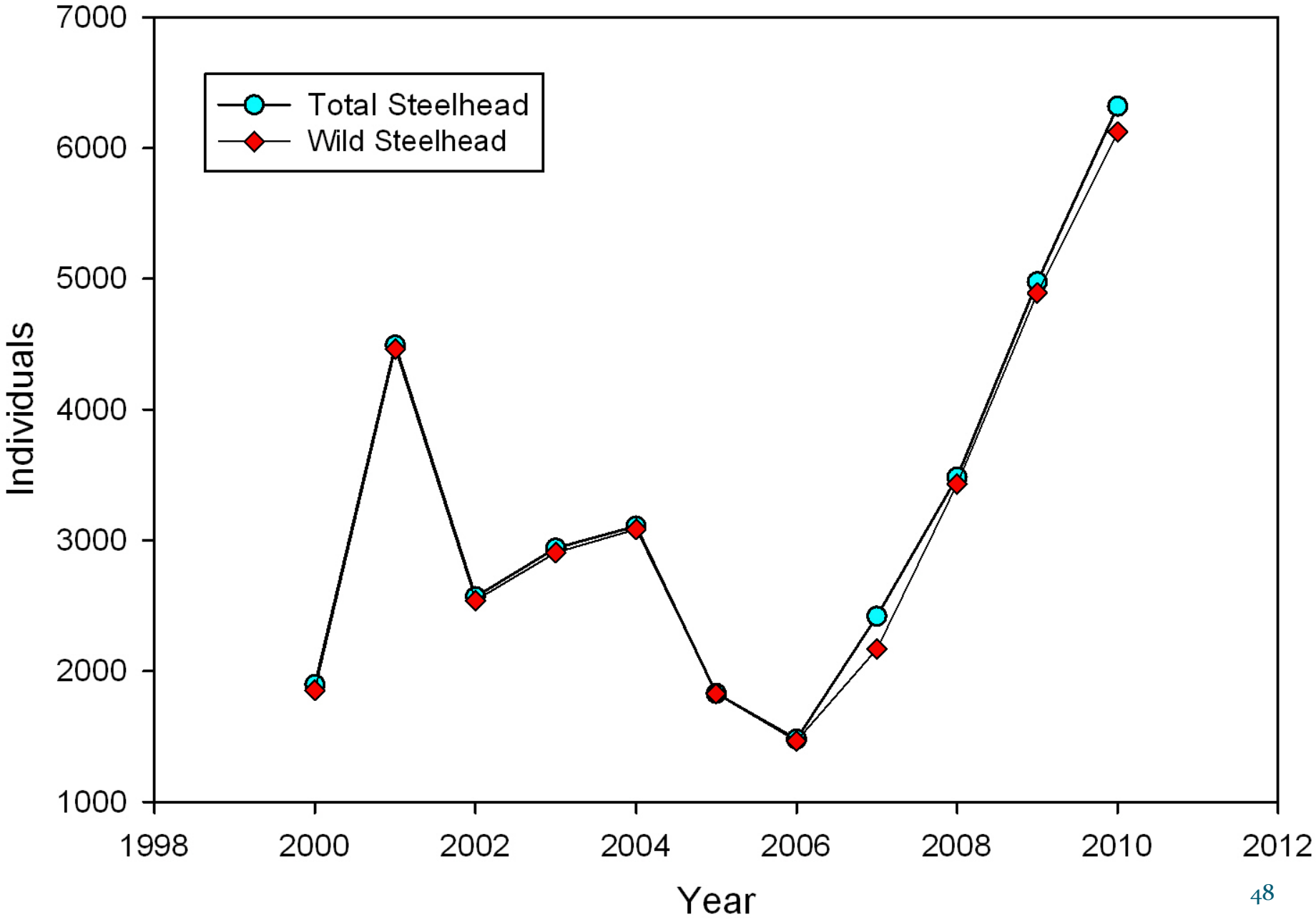


Figure 37. Cumulative amount for insecticide detections at the Marion Drain site, 2006-2008.

WA Dept Of Ecology, 2009. Survey of Pesticide in Salmon Bearing Streams

Steelhead Returning to Lower Yakima and Naches River



Economic Conclusions

- **Difficulties interpreting NMFS Economic Analysis**
- **In most of the watersheds, NMFS did not find pesticide use to be a major cost resulting from consultations**
- **Potential large losses for crops affected by buffer restrictions**
- **Tree crops, especially apples, are most affected by the buffers**

Conclusions

- **GIS tools are powerful analytical tools, but challenges arise when data are of different temporal and spatial scales and levels of detail**
- **Little data available on the effectiveness of no spray buffers as a tool to decrease pesticide concentrations in surface water**
- **Pesticide transport mechanisms other than spray drift not addressed by no spray buffers**
- **Retrospective assessment may be difficult and time consuming, but may be warranted**